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VOLUME XVIII NUMBER 2

DISEASES

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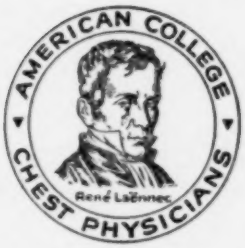

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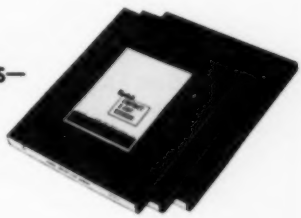

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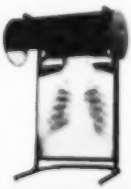

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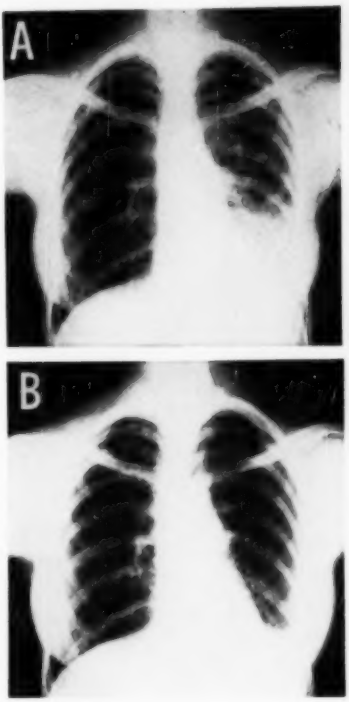

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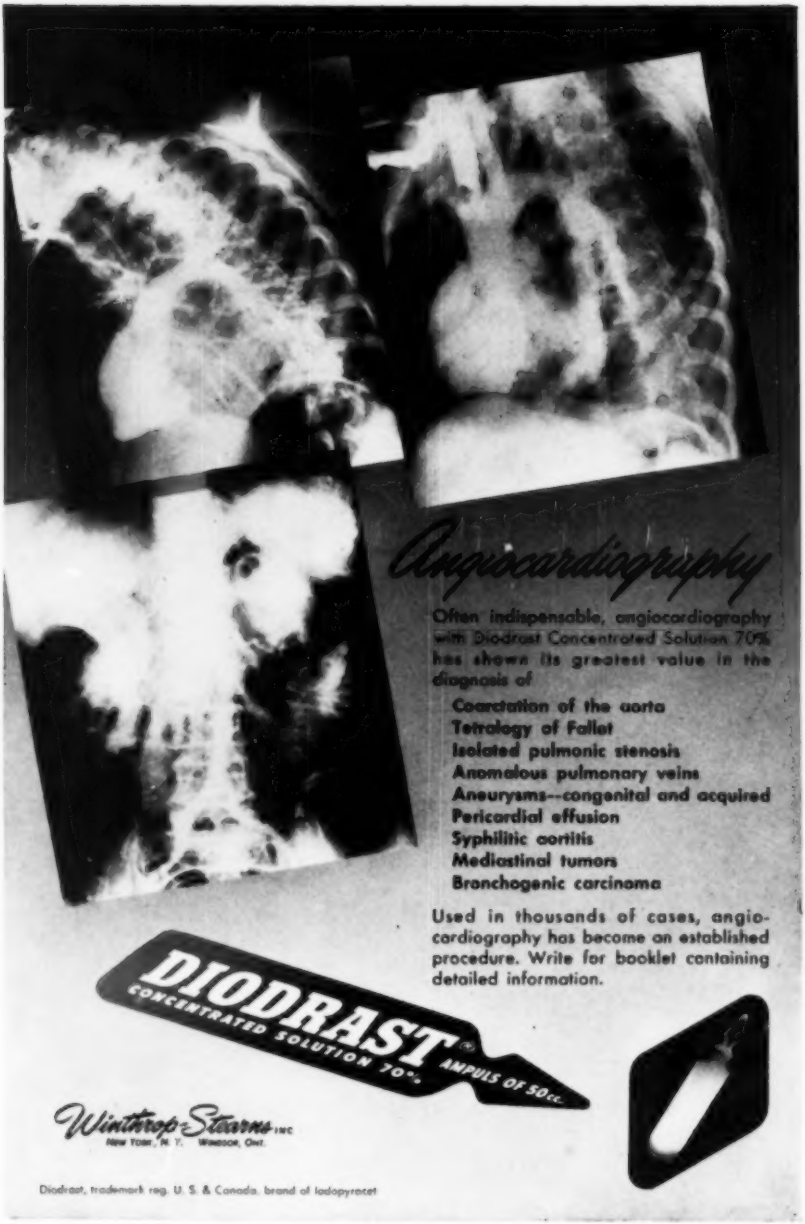
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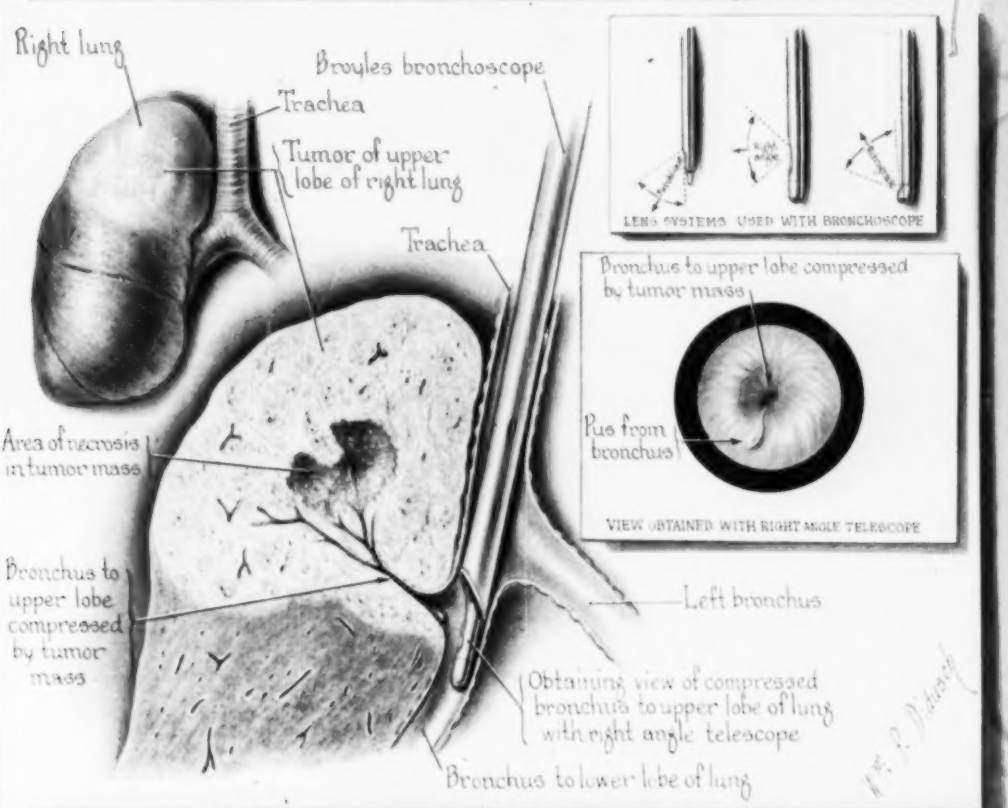
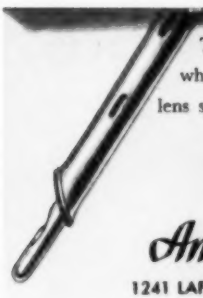

Right lung
Broyles bronchoscope
Trachea
Tumor of upper lobe of right lung
Trachea
Area of necrosis in tumor mass
Bronchus to upper lobe compressed by tumor mass
Left bronchus
Obtaining view of compressed bronchus to upper lobe of lung with right angle telescope
Bronchus to lower lobe of lung
LENS SYSTEMS USED WITH BRONCHOSCOPE
Bronchus to upper lobe compressed by tumor mass
Pus from bronchus
VIEW OBTAINED WITH RIGHT ANGLE TELESCOPE



The illustration shows a case of suspected tumor of upper lobe of right lung in which x-ray findings were inconclusive. The Broyles Bronchoscope with right angle lens system disclosed a compressed bronchus, and a diagnosis of tumor was made.

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DISEASES *of the* CHEST

VOL. XVIII AUGUST 1950 NUMBER 2

The Use of PAS in the Treatment of Draining Tuberculous Empyemata*

M. R. LICHTENSTEIN, M.D., F.C.C.P.† and PAUL ALFANO, M.D.††
Chicago, Illinois

Reports of excellent results in the treatment of tuberculous empyema with PAS led to this trial of its efficacy. We were unable to repeat the method previously reported (instillation of a suspension into closed empyema space) because we had available only patients on whom thoracotomy had been performed. In this work we, therefore, investigated the effect of oral PAS therapy and the effect of local PAS packs.

The patients studied all had proved tuberculous empyemas with secondary infections. All had thoracotomies. Many had previous surgery: In the 22 patients studied, 12 had thoracoplasties; two pneumonectomies; four unroofing procedures; one lobectomy; one decortication; and one cavernostomy. Practically all patients had at least one previous course of streptomycin, and most were resistant to 100 micrograms per cc.

The 22 patients were divided into 11 treated and 11 placebo cases. Each group contained a range of cases from mild to severe, as evenly matched as possible under the circumstances. Table I shows the color, sex, age, duration of disease, duration of empyema, fever and weight before and after treatment.

The 11 treated cases received sodium salt of PAS, 3 grams q.i.d., orally, in a liquid preparation (20 per cent solution, peppermint flavored), for 120 days. The 11 placebo cases received a prepara-

*From the Clinical and Research Departments of the City of Chicago Municipal Tuberculosis Sanitarium.
This investigation was supported (in part) by a Research Grant from the Division of Research Grants and Fellowships of the National Institutes of Health, U. S. Public Health Service, and assigned to Dr. Henry C. Sweany as Chief Investigator.
Presented before the Illinois Chapter of the American College of Chest Physicians on January 13, 1950.
PAS was generously furnished for this study by the Massengill Co., for which we are duly grateful.
†Chief of Medical Service.
††Attending Thoracic Surgeon.

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TABLE I: Data Concerning Patients on Oral Therapy, Placebo Therapy, and Local Packs

Case No.	Pt.	Color, Sex	Age	Tuberc. for yrs.	Empy. for yrs.	Highest Temp. 1 Mo. Pre-Rx	Weight 3 Mos. Pre-Rx.	Temp. Post-Rx.	Weight Post-Rx.	4 Mos. Oral Rx.	2 Mos. Local Rx.
1	JM	N-M	31	2.5	1.5	99.0	165-171	98.0	188	Placebo	Saline
2	ER	W-F	37	20	7	101.0	136	99.0	145	Placebo	Saline
3	EW	W-M	63	3	1.5	99.0	131	*		Placebo	0
4	MB	W-F	27	3	2.5	102.0	92-99	98.6	107	Placebo	Saline
5	MT	W-F	51	15	2.2	99.0	96-101	101.0	97*	Placebo	0
6	PM	W-F	64	2	2	98.8	106-120	98.6	133	Placebo	0
7	DH	N-F	25	2	0.5	98.6	112-107	98.6	109	Placebo	0
8	AS	W-F	34	8	2.2	99.4	92-97	99.0	95	Placebo	PAS
9	HN	W-F	38	2.5	2	99.8	170-173	98.6	172	Placebo	PAS
10	TS	W-M	38	11	0.75	100.0	110-105	99.0	109	Placebo	PAS
11	AZ	W-F	34	9	1.5	98.6	108-116	101.8	121	Placebo	PAS
12	KP	W-F	32	10	0.3	99.0	101	99.0	102	PAS	PAS
13	GG	W-F	34	7	1.5	100.0	118-122	98.6	119	PAS	PAS
14	EM	W-M	36	15	0.75	101.0	147-139	98.6	133	PAS	PAS
15	CO	W-M	48	10	0.6	99.0	95	98.6	101	PAS	PAS
16	VR	N-M	39	1.5	1.2	100.8	132-118	98.6	123	PAS	Saline
17	RL	W-F	42	3	0.5	101.0	96-90	100.0	91	PAS	0
18	SC	W-F	32	2.2	0.25	102.8	122-120	99.2	122	PAS	Saline
19	MA	W-F	23	4.5	1.5	98.6	118-113	98.6	115	PAS	0
20	MZ	W-F	33	12	10	100.4	138	99.0	142	PAS	Saline
21	LD	W-F	38	6	3	98.6	105-107	98.6	116	PAS	0
22	LS	W-F	31	11	2	99.0	85	99.2	95	PAS	0

*Expired.

tion whose appearance and taste closely resembled the above, for the same length of time. After 60 days of the above management, four patients in each group were treated twice daily with NaPAS 5 per cent packs in the wounds for the last 60 days of the experiment. Saline packs were used in several other patients in each group for the same period. No packs could be used on some because of large broncho-pleural fistulas.

Observations: The clinical effects were determined by bi-weekly interviews with each patient, beginning before therapy. General condition, cough, quantity of sputum, fever, and weight were recorded. Complete blood counts were done every month; urinalyses every two weeks; sedimentation rates every month; smear, culture, and cytology of pus every two months. Levels of PAS in blood were determined every month. One level on the pus from each patient was done while on oral therapy alone.

The appearance of the wound was recorded at intervals. The size of the empyema space was determined at the beginning, middle, and end of the period of treatment by measuring the amount of saline required to fill it. (This could not be done on those with large broncho-pleural fistulas).

X-rays of the chest were taken every month; sinograms were made before and after treatment.

Results

Clinical Effects: Cough improved markedly in five treated and two placebo cases. Expectoration was markedly diminished in five treated and one placebo patient. Fever improved markedly in three treated and no placebo cases. Marked weight gains occurred in six of each group. More than half the patients in each group stated that they "felt better."

Mortality: One patient in the placebo group died after six weeks of the period, as a result of cor pulmonale. Another in the same group died at the end of the period because of toxemia and cachexia.

Laboratory Findings: The sedimentation rate dropped more than 10 mms. in six treated and seven placebo patients. (Cutler method, 30 min.). Hemoglobin determinations showed no significant differences between the two groups.

Pus: All but two treated and three placebo patients had tubercle bacilli in the pus on smears at the beginning of treatment. At the end all the positives remained so except three in the treated group; two of these had very few bacilli at the beginning and were negative on culture at the end.

Cytological examination of the pus smears showed mainly polymorphonuclears with some lymphocytes and an occasional eosino-

phile throughout treatment. No significant differences were noted between the oral treatment, local treatment, and placebo patients.

Blood levels (one hour after A.M. dose) averaged 7.02 mg. per 100 cc. (low 3.4, high 10.4) in the patients on oral PAS. Pus revealed evidence of PAS in five patients, averaging 1 mg. per 100 cc. (low 0.1 and high 1.6); in five other patients on oral PAS no drug could be found in the pus.

Physical examination of the wound at intervals revealed a cleaner appearance in those treated with local PAS packs, and a thinning and diminution in the pus was noted in the same group.

The size of the cavity diminished in both the treated and untreated groups. No definite differences are noted.

TABLE II
Capacity of Empyema Cavity Before and After Therapy

	VOLUME OF CAVITY (cc.)		
	Before	2 Mos.	4 Mos.
ORAL PAS			
Pt. A	115	75	62
Pt. B (PAS packs)	40	40	30
Pt. C	4	3.5	1.5
Pt. D	4	3	1.5
Pt. E (Saline packs)	10	10	4
Pt. F (PAS packs)	105	85	70
Pt. G (Saline packs)	1400	1500	1150
PLACEBO ORALLY			
Pt. H (Saline packs)	60		40
Pt. I (PAS packs)	65	50	35
Pt. J (Saline packs)	70	47	45
Pt. K (PAS packs)	240	300	215
Pt. L (PAS packs)	750	600	450

Sinograms corroborated the above finding.

X-ray films of the chest revealed improvement in the contralateral lung in two of the treated cases.

Toxic effects were negligible. Mild nausea and diarrhea with occasional emesis disturbed a few patients. Local sodium salt of PAS was non-irritating.

Discussion

It appears evident from the above that oral therapy with the sodium salt of PAS, when it produces a good blood level, allows but little of the medicament to seep through into the empyema pus in about one-half the cases. A course of 120 days of oral treatment produced no very definite improvement as compared with the usual slow rate of healing noted in some of the untreated patients.

Local therapy in the open cases is difficult to apply satisfac-

torily. Packs produced a somewhat cleaner appearing wound, and a diminution and thinning of the pus. However, no perceptible increase in the rate of healing could be noted.

It is possible that longer periods of oral therapy or better methods of application of local therapy may prove to be more beneficial than the limited procedures reported here. Studies are in progress on the treatment of closed empyema. In these, instillation with prolonged application of the drug is possible.

In spite of the lack of any dramatic effects on the empyemas, the oral use of PAS seemed to exert a restraining effect on the constitutional symptoms. This was not as marked as that noted in the acute exudative cases previously reported from this institution.[2]

CONCLUSIONS

1) This report describes studies of 22 patients with tuberculous empyemas, draining through thoracotomies. One-half of the patients were treated for 120 days with oral PAS, the other half with a placebo. Local packs of 5 per cent of the sodium salt of PAS were used for 60 days on eight patients, saline packs on others.

2) PAS therapy produced no significant improvement in the treated cases as compared with the untreated.

3) Local packs of the sodium salt of PAS caused some thinning and diminution in the amount of the draining pus, and produced a cleaner appearing wound.

4) Constitutional improvement was slight.

CONCLUSIONES

1) Se presenta un estudio de 22 enfermos con empiema tuberculoso, drenados con toracotomias. La mitad de estos enfermos fueron tratados con PAS por boca por espacio de 120 días—la otra mitad fué tratada con placebo. Ocho enfermos fueron tratados con una solución al 5 por ciento de PAS localmente por espacio de 60 días; suero fué usado en otros.

2) El tratamiento con PAS, no ha producido una mejora notable, cuando se comparan con los casos, que no han sido tratados.

3) El tratamiento local con PAS, produjo licuefacción y disminución de la cantidad del pus drenado; y el aspecto de la herida mejoró.

4) El estado general mejoró lijeramente.

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Endoscopic Collection of Neoplastic Cells and Tubercle Bacilli from the Bronchi

(Description of a New Irrigation-suction Collector and the Anatomical, Physiological, and Pathological Factors Involved)

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The problem of early diagnosis in pulmonary disease constantly confronts the diagnostician and only too frequent are the pleas in the literature to send cases to the surgeon or the phthisiologist more promptly. Unfortunately the pathogenesis of both pulmonary neoplasms and pulmonary tuberculosis is of such a nature that; in spite of mass surveys, lesions are not always followed because of their apparent harmlessness or confusion with benign states. On the other hand they may appear after a negative report has reassured the patient that all is well. The flare for mimicry of both these entities as well as the speed or tardivity with which they progress is at times discouraging.

The far-advanced case is in reality no problem since the lesion is usually accessible to standard diagnostic procedures or the clinical picture is such that it is almost impossible to miss the diagnosis. On the other hand, the prognosis and the jeopardy of surgery are proportionately increased. Too often a lesion presents itself which may tax the ingenuity of all concerned by its inaccessibility to the usual methods of diagnosis and an operation may be recommended on a supposition with the subsequent gross loss of tissue and vital capacity. Only too often a lung removed for a neoplasm reveals silicotic nodules, tuberculomata, calcified focci or benign lesions of one type or another. Unless a proper diagnosis is made, in the face of present-day cancrophobia, pneumonectomy may easily become the vogue on a mere supposition.

In spite of the fact that we are all aware that lesions of the chest are too frequently found in far-advanced stages or definitely misdiagnosed,[6] the fault does not always lie with the physician or the patient. The general practitioner, who in most cases is the first contact for the patient in the medical echelon is trained to diagnose and treat in the face of symptoms and to refer for specialized studies once again in the face of symptoms. The pa-

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tient on the other hand waits for symptoms before presenting himself for examination. In pulmonary disease, however, we must assume as a basic principle that in most cases the presence of symptoms connotes advanced disease states. The answer to early detection of such disease states is perforce more frequent roentgen inspections followed by more specific methods of diagnosis as well as their more universal application.

Present-day Methods of Diagnosis of Diseases of the Chest

Our mainstay to date in the diagnosis of diseases of the chest, exclusive of physical signs, which again presuppose advanced disease, has been the roentgen ray with its ingenious applications: fluoroscopy, fluorograms, flat films, laterals, obliques, apical lordotic views, progress films, stereoscopic films and finally the laminograph. These are all excellent methods of diagnosis in spite of the fact that they merely, with the exception of the laminograph, represent a composite of normal and abnormal shadows projected unto a flat surface. The laminograph is a compromise projection in that only a thin section is projected but its chief disadvantage is that, while in theory it provides for excellent definition, in practice it is reserved for comparatively coarse interpretation of hidden cavities and good-sized endobronchial masses. Fortunately we have built up in the science of radiology a table of experience which places many of these composite shadows into a definite diagnostic pattern. We must consider the fact, however, that similar patterns do not always mean the same disease and hence on occasions resolve into a radiological pitfall.

Bronchoscopy has now gained broad advantages in the differential diagnosis of diseases of the chest; but here again we are limited to lesions which are in the bronchoscopic axis and hence amenable to biopsy. The bronchogram with the exception of the diagnosis of bronchiectatic states has its limitations in that it merely shows a blocked bronchus which may be caused by any lesion or foreign body. Aspiration biopsy may be revealing if the lesion is accessible to the needle, but only too frequently results in a traumatic pneumothorax without a diagnosis being made. Diagnostic pneumothorax is mostly used to determine whether the lesion is attached to the chest wall, the diaphragm, or whether it is part and parcel of the pulmonary parenchyma. Thoracoscopy may be effective if the lesion is peripheral. Exploratory thoracotomy is comparable to exploratory laparatomy and has its technical restrictions to accessible lesions; otherwise it is tantamount to the actual operation of lobectomy or pneumonectomy.

In the diagnosis of pulmonary tuberculosis most of the methods, with the exception of the x-ray, are aimed at the recovery and

identification of the tubercle bacillus for a positive diagnosis. Examination of the sputa either directly or by concentration methods is the easiest and most popular. Cases of paucibacillary tuberculosis, however, are frequently not diagnosable by this method. Guinea pig inoculations and culture methods give an increase in the yield of positives. Examination of the gastric residue increases the number of positive yields in cases of paucibacillary tuberculosis and can be used in children and non-cooperative patients. It is interesting to note that studies of gastric sediments for tubercle bacilli give many false negatives because of the inhibitory action of the acid, as well as pepsin and gastric lipase, on the viability of the tubercle bacillus making their use for guinea pig inoculation and culture ineffective.[10,14,22] This action is proportional to the time of contact between the bacillus and the gastric juices. More accurate results are obtained by immediate use of the juice or by its neutralization. Studies of the presence of non-pathogenic acid-fast rods in gastric juice would be an interesting development and would better evaluate this test clinically. Skin tests are merely a manifestation of sensitivity and, though of epidemiological value to determine inoculation phases, per se do not make or constitute a diagnosis of clinical tuberculosis. The sedimentation rate has the disadvantage of being nonspecific and is used in tuberculosis as an auxillary diagnostic measure or to check the progress of the disease. Finally, there are certain lesions suspicious of tuberculosis which are watched by temperature control and progress films which make this procedure also a method of diagnosis.

Much as in neoplasms the early diagnosis of pulmonary tuberculosis is too well inculcated in medical minds to re-emphasize. Early lesions can be treated by simple procedures and arrest obtained without the economic loss and the necessity for gross surgical procedures which become in reality salvage operations.

Endobronchial Methods of Diagnosis of Diseases of the Chest

Review of the literature in diagnostic procedures in the diagnosis of diseases of the chest reveals an increasing effort to get closer and closer to the pathological unit of disease by methods of direct approach to the bronchial tree and its subdivisions. The first organized impetus came after Papanicolaou[18] discovered that neoplastic lesions in the uterus exfoliated characteristic cells which, under the microscope and with trained interpretation, gave a pathognomonic picture as revealing as the tissue section. It was not long thereafter that the method was applied to the pulmonary system for detection of pulmonary neoplasms.[6,11,13,23,24] The incidental findings of tubercle bacilli in the bronchial secretions by

Clerf and Herbut[12] have added a similar method of diagnosis of pulmonary tuberculosis. An interesting corollary to the studies of Clerf and Herbut is the popularization of the method of bronchial lavage for recovery of tubercle bacilli. This method is apparently widely in use in South America[5,6] and sporadically in use in the United States.[2] The technique is relatively simple and consists of either inhalation or instillation by catheter, under surface anesthesia, of sterile saline into the tracheo-bronchial tree and its recovery by cough. Sediments are studied for tubercle bacilli by the usual techniques. The percentage of positive yields by this method as compared with the gastric sediment or other standard methods is revealing. The dangers of droplet infection of attendant personel using this method is, however, not discussed in any of the papers encountered.

It would seem that the examination of the endobronchially obtained secretions is the best answer to the earliest possible recognition of pulmonary neoplasms which are not approachable by conventional methods. When positive, the results are as revealing as a tissue section. The facility of this method, its lack of danger, and the high percentages of positive results in controlled cases (82.4 to 92.5 per cent)[13] should make it the procedure of choice. The use of simple sputa is comparable to the method used in pulmonary tuberculosis. It is rather coarse and requires concentration methods as well as time-consuming search for characteristic cells. Much as in tuberculosis it presupposes a large yield and hence a far-advanced lesion. This method, however, is not to be condemned as it has good use in surveys and for mailing of specimens to distant laboratories.

What has been said about the examination of the endobronchial secretions for neoplasms applies aptly to their examination for tubercle bacilli. The method is not proposed to the exclusion of standard methods but merely to offer a method of collection in the finer bronchi for the earlier detection of the tubercle bacillus. Present experience is enough to warrant the statement that early lesions do discharge recoverable bacilli and these have been found in cases where no roentgen evidence of disease was present until six to eight weeks after pathogenic tubercle bacilli were isolated. The cases cited had pulmonary hemorrhage as the indication for the study.

Effects of Bronchoscopy on Pulmonary Tuberculosis

The most common deterrent to exploration of the tracheobronchial tree in pulmonary tuberculosis has been the fear that the procedure would activate the disease. Another is the danger inherent in the bronchoscopy per se or to the anesthetic. Unfort-

unately there is still a wide-spread belief that simple bronchoscopy is a rather formidable procedure. Coates and Osborne[7] have reported a series of 473 bronchoscopies in 233 patients at Trudeau Sanatorium with no roentgen evidence of increase of the disease in a two-month period following bronchoscopy as compared with a similar period prior to bronchoscopy. A parallel observation was made by McInabe, et al,[16] who bronchoscoped 272 patients with pulmonary tuberculosis with an increase of the tuberculosis in only four patients and this was not considered serious. The author has had the same experience with many bronchoscopies on tuberculous patients with no detectable spread of the lesions. In proper hands the procedure of bronchoscopy itself should be devoid of danger. The real danger lies in the use of excessive amounts of surface anesthesia. Review of the literature on such deaths[11,19-21] would indicate that these were distinctly attributable to excessive amounts of the surface anesthetic. The author has developed a technique and innovations of instrumentarium[3,4] which permit him to use subposological doses of the local anesthetic (Pontocaine) with no ill-effects attributable to the drug whatsoever; and this in spite of the fact that no barbiturates were used to counteract the effects of the Pontocaine. The series to date consists of 478 bronchoscopies without selection.

Pulmonary Anatomy, Physiology, and Pathology in Relationship to the Collection of Tumor Cells and Tubercle Bacilli

Fortunately for the clinician the structure of the lung is such that there is continuity of its smallest subdivisions to the larger, and fortunately again the pathogenetic development of both the lesions of neoplasms and tuberculosis is such that at some time or other there is discharge of the products of these lesions into the normal channels. This discharge may occur earlier than is usually realized because of the delicate normal structures involved. In the case of neoplasms their very nature of growth results in ischemia with subsequent necrosis as well as attrition of the surface of the parent mass by the constant respiratory movements of the lungs. Focii from inhalation tuberculosis are usually formed in the subpleural area and eccentric to or around the bronchioles and blood vessels.[1] Because of the inherent property of tuberculous focii to cascate and ulcerate, the wall of a small bronchus may become eroded and the contents of the lesion discharged into an air passage.[1]

The normal excretory forces constantly at work in the lungs are all integrated for the purpose of forwarding foreign bodies, secretions, or exudates from their source into the progressively larger normal channels until expulsion from the tracheo-bronchial

tree is possible. These normal excretory forces may be overcome by the size of the unit mass (foreign body) or by the greatly increased numbers of unit masses (pulmonary edema, pneumonoconiosis, lipoid pneumonia). A study of the distribution of the sensory endings in the bronchi[9] shows that they become more and more infrequent as the lower levels are reached. Cough usually begins when the offending mass has moved up out of the respiratory part of the lobule to the point where the receptors are more numerous.[9] Jackson[9] has demonstrated the easy fatigability of these endings when he made the observation that an irritant applied to the bronchial mucosa resulted in cough but when the irritant was not removed nor its intensity increased, the cough gradually subsided.

Offending particulate matter at the lowest levels of the respiratory system (alveoli) is removed by three mechanisms: First, through the open alveolar duct into the bronchioles and progressively larger air passages; secondly, by way of the superficial lymphatics which follow the first radicle of the pulmonary vein from the center of the primary lobule to its periphery and then course outward to join the subpleural plexus of lymphatics which in turn unite forming lymph vessels that empty into the hilar lymph nodes; thirdly, by way of the deep lymphatics which follow the course of the bronchial and vascular trunks towards the hilar lymph nodes.[15]

The excretory mechanism which concerns us in the recovery of tumor cells and the tubercle bacillus is the first. Regardless of where the break-through occurs, we must assume, because of the intrinsic basic structure of the lung, that it will occur in one of the finer subdivisions. Once this occurs the microscopic defense mechanism against foreign matter begins its operation. In the case of the cancer cells probably no definite organized defense occurs and phagocytosis plays a minor part since the cells are usually larger than 10 microns which is the size limit that a phagocyte may ingest.[15] The slough lies in the lumen and may behave as an inert foreign body calling forth some phagocytes and secretions to form an exudate about it. When large enough the exudate irritates the mucosa and is removed by the mechanisms to be described. In the case of the tubercle bacillus, however, a definite, well-studied response is had. Polymorphonuclear leukocytes are called forth and begin ingesting tubercle bacilli as well as the products of caseation. In this they are helped by the mononuclear phagocytes of the blood as well as the alveoli and ducts. The entire ensemble, in addition to fluid elements, again forms an exudate to be expelled.[15]

Motion of the exudate is towards the ductus alveolaris, if the

origin is in the alveolus; or towards the larger channels if it is formed elsewhere in the open airways. The pneumodynamic force of contracting air captured distally to the exudate acts as an air-hammer against the exudate and forces it along the path of least resistance, cephalad. The spiral musculature which reaches almost to the alveoli[17] shapes and molds the exudate to facilitate removal. As the exudate rises to the ciliary level (0.3 to 0.4 mm. bronchioles)[17] the new force of ciliary action which is always towards the larger air-ways begins to work. Rhythmic variations in the size of the bronchi as well as the lubricatory action of the products of the globet cells, beginning at 0.4 mm. bronchioles,[15,17] add another phase of the excretory mechanism. As the exudate is propelled cephalad to bronchi of a larger size and greater sensitivity,[9] the powerful expiratory effort of cough with its great increase in intrabronchial pressure exerts a pneumatic force against the exudate. This results in actual projection of the exudate from the bronchi like a bullet from an air rifle.

For our purposes it suffices to say that the mechanism of excretion from the lungs is effective unless overwhelmed, but its study also provides us with the fact that early disease may be present without the accompaniment of cough.[9] Also that the pathogenesis of tuberculosis and neoplasms is such that tubercle bacilli and exfoliated cells may be found far down in the bronchial tree and in many cases free in the lumens where they are recoverable by endobronchial aspiration.

Method of Use of the Irrigation-suction Apparatus

In studies of the normal bronchial tree the gentle scraping action of the spiral tip was sufficient on some occasions to make possible recovery of almost complete microscopic sections of the mucosa with all its histological characteristics: cilia, cuticular border, intact ciliated cell bodies, as well as the intermediate and basal cells. This gentle trauma did not result in bleeding, though occasionally blood-tinged yields are obtained. The presence of the formed elements of the blood can be used as a measuring stick when comparing cell sizes. The admixture of these elements did not cause confusion. It is felt that the use of gentle trauma has on some occasions resulted in the recovery of cells which were more characteristic of the parent mass than those that had been exfoliated.

In actual use the apparatus is introduced under direct vision into the bronchial branch orifice desired until it stops. Gentleness, of course, is essential as the spurs and the bronchial walls at lower levels are proportionately delicate and haste or pressure would result in a perforation. Three cubic centimeters of sterile saline

are then introduced; the petcock of the syringe closed; and the entire apparatus moved gently in and out for about one centimeter without disengaging the apparatus from the bronchus being studied. A short pause is then necessary to permit the solution to flow along the spiral tip by capillarity and by the negative suction action of inspiration. This pause is also necessary to give time for the cells or tubercle bacilli to be scraped off the mucosa and floated before they are aspirated. The process is repeated until at least 10 cubic centimeters of saline have washed the bronchus. Too long a period must not lapse after each instillation of the saline as too great an amount of the solution will be sucked into the alveoli and not recovered. The usual yield with this apparatus will average from five to eight cubic centimeters with a loss of two to five.

By this method it is possible to irrigate any lobar bronchus or any of the approachable segmental bronchi either selectively or seriatim. In the latter it is advisable to have entirely separate apparatus for each segmental or lobar bronchus to avoid errors through contamination. This change as well as the proper labeling of the reservoirs permits the operator to fairly well localize a lesion which will, in all probability, be confined to the bronchus with the greatest yield of tumor cells or tubercle bacilli. Due consideration must be given, however, to the possibility of contamination of non-lesion bearing bronchi by aspiration of cells or bacilli from the parent lesion.

Processing the Washings

It will be noted that the apparatus is equipped with a conical reservoir which is much similar to the 15 millimeter centrifuge tube. This permits direct centrifugalization of the yield in the standard centrifuge without the necessity of transfer. Centrifugalization is accomplished for 20 minutes at high speed and the fluid portion decanted by simple inversion. The packed residue is then aspirated in a long medicine dropper and smears made from the droplets on five cover slips—fewer may be used depending on the amount of yield. In cases where the secretions are abundant standard slide procedures may be used. For the study of tubercle bacilli the entire yield is spread on a slide, fixed, and stained by standard methods. For guinea pig inoculation and culture, the uncentrifuged specimen is transferred to a sterile test tube and submitted to the laboratory.

For the Papanicolaou stain the cover slips are placed in a small brass basket grooved to receive the slips and fitted with a handle. The entire basket is passed through the solutions seriatim. Solution containers consist of ordinary stock six ounce powder jars

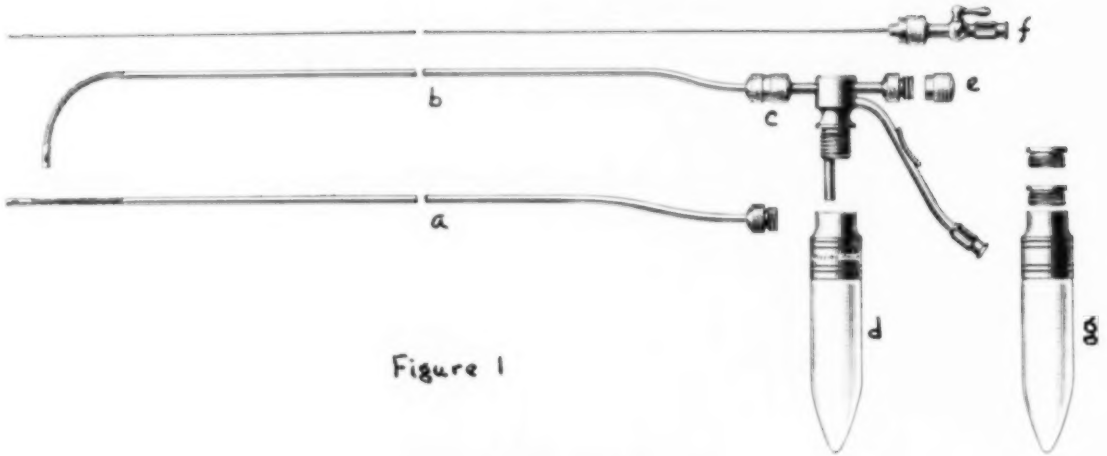

Figure 1

(a) Straight, flexible tip collecting tube.
(b) Curved, flexible tip collecting tube.
(c) Collecting head.
(d) Reservoir.
(e) Closure.
(f) Irrigation insert.
(g) Extra reservoir and closure.

with enameled tin screw covers. These are inexpensive and available at all drug stores. They are more effective in preventing evaporation between use. On completion of the stain, the cover slips are mounted on slides with Canada balsam. Usually a rather thin specimen is had by this method which makes possible good study without the cellular super-imposition seen on thick smears.

The Irrigation-suction Cell and Tubercle Bacilli Collector (Figure 1)

The principles followed in the design of this collector were those of complete visibility in the bronchoscopic axis and the possibility of almost simultaneous irrigation and suction through a tube with an external diameter of two millimeters which permits one to enter deeply into the tracheo-bronchial tree. In the development of this collector those designed by Clerf, Lukens and Tucker were thoroughly studied and one must admit that the basic principle and concept are not original. The improvements are. This collector will enter a 3 mm. x 45 cm. bronchoscope though no visibility is had with the collector in situ. Vision is obtained through the bronchoscope without the collector; the bronchus to be studied engaged; and the apparatus introduced blindly. With the 5 mm. x 45 cm. bronchoscope good vision is had with the apparatus within the bronchoscope and the bronchi entered with the usual techniques.

The Collecting Tubes

The collector is equipped with two tubes, one with a straight and the other a curved flexible tip. The actual length of these tubes is 53 cm. but the working length is 50 cm. This length permits working with 45 cm. bronchoscopes with still considerable lee-way in penetrating deeply into the lower respiratory passages. The external diameter of the tubes is 2 mm. which is a distinct advantage in probing bronchi of approximately this size. A lazy "S" design to the proximal end permits the tube to lie on the floor of the bronchoscope with no impediment to the line of vision. This end is also provided with a knurled taper swivel which permits rotation at any point of a 360 degree circle with positive locking and no compromise to the line of vision.

The Collecting Head and Reservoir

The collecting head has a "T" channel, the long arm of which communicates directly with the reservoir chamber. One portion of the "T" provides attachment by the taper swivel lock to the collecting tube and the other portion provides an air and water-tight taper lock for the irrigating insert.

The Irrigating Insert

This consists of a stainless steel tube of small diameter with spring temper. Its length is such that when inserted into the collecting tube it comes to within 1 cm. from the proximal attachment of the spiral. It was found that any greater length would compromise the lumen of the spiral insertion as this is somewhat smaller than the diameter of the collecting tube proper. On the proximal end the irrigating channel is equipped with an air and water-tight taper lock for attachment to the head of the collector. A small stop-cock was added to close off the syringe from the system. Otherwise the syringe would be emptied when suction was applied. A female luer-lok attachment completed its assembly. This permits the use of standard Luer-Lok syringes. The author uses a 10 cc. syringe though a larger or smaller one may be used depending on what is desired.

For cases in which the secretions are abundant and the irrigation insert is not necessary, a closure for the irrigation channel port is provided with the apparatus. In this manner the apparatus may serve a dual purpose. With the use of the taper swivel locks the apparatus becomes a rigid and durable assembly, which can be manipulated with one hand. Wear on the tapers is immaterial inasmuch as any degree of tightness may be effected by tightening the knurled lock.

Other Uses for the Irrigation-suction Apparatus

In spite of the fact that this apparatus was primarily designed for the better collection of neoplastic cells other uses at once became obvious. The collection of tubercle bacilli from questionable lesions became so important that its use for this purpose was incorporated in this paper. The apparatus may be used for the detection of the etiological agents of mycotic diseases of the lung, clinical research in occupational dust inhalations, irrigation of both bronchiectatic areas or pulmonary abscess, as well as the instillation of antibiotics or other medications into the lower subdivisions of the bronchial tree.

The irrigation-suction collector for tubercle bacilli and neoplastic cells is being manufactured by the George P. Pilling & Sons Company, 3451 Walnut Street, Philadelphia, Pennsylvania, to whom the author has given the specifications for the manufacture of this instrument.

SUMMARY

1) The endoscopic approach to the positive diagnosis of pulmonary neoplasms and tuberculosis is discussed and compared to standard methods.

2) The anatomical, physiological, and pathological mechanisms

concerned in the recovery of neoplastic cells and tubercle bacilli are described.

3) A new irrigation-suction cell and tubercle bacillus collector which permits collection from lower subdivisions of the bronchi is described in detail.

4) The apparatus described permits either selective or seriatim irrigation and suction of the lobar bronchi or of the approachable segmental bronchi making possible diagnoses in a more limited anatomical area.

RESUMEN

1) Se discute y se compara con el método estandar la via endoscópica para el diagnóstico de los neoplasmas y la tuberculosis.

2) Se describen los mecanismos que intervienen en la obtención de celdillas neoplásticas y bacilo de la tuberculosis.

3) Describese en detalle un nuevo aparato colector de bacilos y de celdillas de las subdivisiones más bajas de los bronquios.

4) El aparato descrito permite ya sea irrigación selectiva o seriada y succión de los bronquios lobares o del segmento investigado haciendo asi posible el diagnóstico topográfico limitado de las lesiones.

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The Significance of Unstable Tuberculin Reactions

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Since 1940, a definite program has been in effect at the Chicago Medical School to control tuberculous infection among the students in residence. This has been implemented through the Student Health Service by physical examinations, annual chest roentgenograms, tuberculin testing, and vaccination with BCG.

A chest roentgenogram and tuberculin test are performed on each incoming student. The chest x-ray is repeated annually, or more frequently, as is deemed indicated. The routine of the tuberculin test is as follows:

Each subject is injected intradermally with 0.1 cc. of a 1:5000 dilution of O.T. If a reaction is observed 48 hours later no further tests are performed. If there is no reaction a second test using 0.1 cc. of a 1:100 dilution of tuberculin is performed. In this report, only individuals exhibiting no response to the second tuberculin test were considered non-reactors to tuberculin. Reactions were interpreted according to the National Tuberculosis Association standard.

To integrate the results of the tuberculin tests into the over-all program, the following policy of retesting was adopted:

Non-reactors were retested at semi-annual intervals. Reactors were divided into two groups; high degree of sensitivity (reaction to 1:5000 O.T.), and low degree of sensitivity (reaction to 1:100 O.T.). Subjects in the first group of reactors were retested only at the end of their schooling period (36 to 45 months after the first test). Subjects in the second group of reactors were, at first, retested at the end of their schooling period but, later, were retested at semi-annual intervals. As a result of this policy of retesting, certain observations regarding the stability of tuberculin sensitivity were made which seemed to be of some interest.

Table 1 summarizes the character of the response to the tuberculin test on initial examination of the students on entrance to medical school. During the period of the study 720 persons have come under observation. Eleven classes are covered, eight of which have completed their training. Of the 487 reactors, 293 reacted to the first test and the remaining 194 only to the second test.

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Of the 215 non-reactors, 109 were vaccinated with BCG, leaving the remaining 106 for studies of the conversion rate.

Of the total number of students who entered school as non-reactors, 78 have completed their training. The rate of conversion for this group is summarized in Table 2. An effort was made to determine whether the conversions occurred more frequently in the last (clinical) two years of medical school or in the first. As can be seen from examination of the table, conversion took place

TABLE 1

Tuberculin Reactions on Entrance to Medical School

Class No.	Total	NUMBER REACTORS — 1:5000 O.T.	NUMBER REACTORS — 1:100 O.T.	No. Neg.	No. Quest.	Per cent Reactors
1	63	34 (33)*	13 (9)	15	1	74.6
2	65	36 (29)	12 (7)	17	0	73.8
3	72	34 (30)	13 (4)	25	0	65.3
4	72	25 (19)	21 (17)	24	2	63.9
5	65	30 (19)	20 (10)	12	3	76.9
6	72	35 (32)	14 (11)	21	2	68.0
7	46	12 (17)	18 (8)	16	0	65.2
8	48	20 (15)	14 (12)	13	1	70.8
9	75	21	19	34	1	53.3
10	70	27	19	21	3	65.7
11	72	19	31	17	5	69.4
TOTALS	720	293 (194)	194 (78)	215	18	67.6

*Number in parentheses indicates the number who have completed their training and were retested before graduation.

TABLE 2

Conversion Rate Among Non-Reactors

Total Number Non-Reactors	106
Number Completing School	78
Number Reactors at End of Two Years*	28
Per Cent Reactors at End of Two Years*	35.9
Additional Number Reactors at End of Four Years*	21
Per Cent Reactors in Last Two Years*	42.0
Total Conversions	49
Cumulative Per Cent Conversions	62.8

*Refers to academic years.

at a more or less equal rate in both periods. This was not a surprising finding since a continuous educational effort by the Student Health Service was in force to apprise the students of the dangers of exposure to known cases of tuberculosis encountered on the hospital wards.

As mentioned in an earlier paragraph, certain of the subjects were retested at regular semi-annual intervals. As a result of this policy, it was possible to gather certain information as to the stability of the tuberculin reactivity of these individuals over the period of observation. In Table 3, the data obtained is summarized. The observed changes in tuberculin reactivity appeared to fall into three general categories:

In Group I are placed the "progressive" changes which could be further subdivided into (1) changes from a non-reactive to a reactive state of either low or high degree, and (2) changes in sensitivity from a low to a high degree. These changes are symbolized in the table, and the symbols are explained in a footnote.

TABLE 3

Instability of Tuberculin Sensitivity

Character of Change in Tuberculin Sensitivity	Number of Observations	Per cent*
1. Progressive		
a. Conversion		
(0) → (1)	21	27.0
(0) → (5)	15	19.2
b. Increase		
(1) → (5)	14	18.0
2. Regressive		
a. Reversion		
(5) → (0)	3	1.5
(1) → (0)	12	15.4
b. Decrease		
(5) → (1)	7	3.6
3. Vacillating		
(1) ⇄ (0)	15	
(5) ⇄ (1)	1	
(0) ⇄ (5) ⇄ (1)	3	

Explanation of Symbols

(0)—Non-reactive.
(1)—Reactive to 1:100 O.T. but not to 1:5000 O.T.
(5)—Reactive to 1:5000 O.T.

*Percentage of the total available number in each category for which completed information is available.

There were a total of 36 stable conversions; i.e., those which remained reactive over the period of observation. The other 13 (note that, in Table 2, the total conversions are given as 49) were unstable and are included in Group III. In 21 instances, the individuals reacted to 1:100 O.T. but not to 1:5000 O.T. In the remaining 15, the conversion was apparently to a higher degree of reactivity, 1:5000 O.T. The former took place in 21 of 78, or 27 per cent of the cases; and the latter in 15 of 78, or 19.2 per cent of the cases. Fourteen, or 18 per cent of the initially low reactors later exhibited a high degree of reactivity.

In Group II are placed the "regressive" changes which could be further subdivided into (1) a complete reversion to the nonreactive state, and (2) a decreased reactivity; i.e., individuals formerly reactive to 1:5000 O.T. which, on retesting three to four years later, reacted to 1:100 O.T. but not to 1:5000 O.T. Of the students who were sensitive to tuberculin on entrance, 272 have completed their training and were retested shortly before graduation. From the table, it is noted that a total of 15, or 5.5 per cent of the reactors showed complete reversion. This confirms reports of a similar nature that have appeared in the literature.[1] It was also noted that these reversions occurred in 3 of 194, or 1.5 per cent of the initially high reactors, and in 12 of 78, or 15.4 per cent of the initially low reactors. This confirms the work of Dahlstrom,[2] that reversion occurs much more frequently in reactors with an initially low degree of sensitivity than in those of high reactivity. As was to be expected from the general trend of the results, a small number, 7, or 3.6 per cent of the highly sensitive individuals later exhibited a low degree of reactivity.

In Group III are placed the "vacillating" changes in which are considered a series of findings on individuals in whom changes in sensitivity wandered over the range indicated by the symbols in the table during the period of observation.

It is impossible, in the present state of our knowledge, to make an unqualified interpretation of the causation of these findings. However, it may be suggested that the skin test with a 1:100 dilution of O.T. possibly does not elicit reactions in some individuals in whom sensitivity has dropped to a low degree. If we may assume that, like other biological phenomena, the degree of sensitivity waxes and wanes within certain limits, it may be that at times when the skin test is applied, it results in no reaction and at other times in a reaction. It is necessary to keep in mind, too, as reported by Paretzky,[3] that skin reactivity varies from one site to another in the same individual. The possibility of the interference of this phenomenon with the results reported was obviated by doing all tests on the volar surface of the fore-

arm. The work of Lumsden, Dearing and Brown[4] suggests the possibility that tuberculins may vary in potency and thus confuse the results. Since the study reported covers a considerable period of time, it was necessary to use different lots of tuberculin. However, we were careful to use only one manufacturer as source throughout. How much the factor of variability of potency has affected the results reported cannot be easily assessed. The impression remains, however, that a certain percentage of the unstable reactions were due to this factor.

It was considered possible that increasing the dosage of tuberculin in the final test for hypersensitivity in any particular instance might increase the number of reactors uncovered. Conversely, a negative result with the increased dosage would establish a firmer basis to the non-reactive state. Seventy-eight tests on subjects who were non-reactive to 1:100 O.T. were tested with a 1:10 dilution of O.T. In order to make a proper evaluation, the results are tabulated (Table 4) in the light of the individual's last known reaction. For comparative purposes, a group of students who had been vaccinated with BCG and thus sensitized to tuberculin, but who had subsequently become non-reactive to a 1:100 O.T. test, were also included. On the whole, the results appear to be unsatisfactory primarily because of the large number of questionable reactions (28 of 78, or 35.9 per cent). Detailed examination revealed that most of these questionable reactions occurred in persons who had been non-reactors for the duration of the period of observation (18) and in persons who had been vaccinated with BCG (8). Only two questionable readings were obtained in individuals who had previously reacted to 1:100 O.T. It it further noteworthy that in none of the 28 individuals consistently negative

TABLE 4

Tuberculin Reactions to 1:10 O.T.
in Individuals Non-Reactive to 1:100 O.T.

	Reaction to 1:100 O.T. Negative Immediately Prior to 1:10 Test But		Reaction to 1:10 O.T.		
	Initially Positive	Initially Negative	Positive	Negative	Quest.
Non-Vaccinated (45)*	17	28	14	1 10	2 18
Vaccinated (33)*	Post-Vaccination All Positive		13	12	8
TOTALS	78		27	23	28

*Indicates number of tests performed on these subjects.

to 1:100 O.T. was there observed a definitely positive reaction with 1:10 O.T. It is obvious that increasing the dosage of tuberculin did not uncover additional reactors, at least in this relatively small series. However, it was useful in confirming the fact that in some individuals previously reactive to 1:100 O.T., sensitivity may still be demonstrable by increasing the dosage of tuberculin. This appears to be so whether sensitivity was due to a natural infection or induced by the administration of BCG.

Discussion

For many years, the impression was prevalent that hypersensitivity created by a tuberculous infection persisted almost indefinitely. Within the last 10 years, there have been a number of reports, adequately reviewed by Sweany,[5] to indicate that this impression was not exactly correct. Keller and Kampmeier[6] have shown that reversion from the tuberculin-sensitive to the non-sensitive state occurred in medical students and nurses in spite of the exposures incurred during the course of their training. Paretzky[7] made a similar observation among reactors even under conditions of exposure to a source case of tuberculosis at home. Dahlstrom,[2] in a larger series, showed more or less the same thing; namely, that reversion of the tuberculin reaction took place in 11.1 per cent of 2490 once-positive reactors. The additional observation is reported in this study, that approximately 80 per cent of the reversions occurred in persons with low degrees of sensitivity (reaction only to 1 mgm. O.T., or to second-strength PPD).

Even in the small series reported in this paper, it has been possible to confirm the findings of the above-cited earlier studies. There has been little attention, however, directed toward the finding that reactivity to tuberculin seems to increase in some individuals. Bluhm,[8] in a study of contacts of known cases of tuberculosis, found that persons living under such circumstances tend to become more highly sensitive than when initially examined. Beskow[9] observed that nurses entering a tour of duty in a tuberculosis sanatorium with a low degree of sensitivity showed increase at the end of a three-month period. In Table 3, it is to be noted that there were 14 individuals in whom a measurable increase in reactivity to tuberculin was noted. It was part of the routine to take a chest roentgenograph of the subject when such an increase was demonstrated. In one case, the change in sensitivity was coincidental with the appearance of a density in the lung field which had not been present in a film taken six months previously. The character and duration of the lesion indicated a roentgenologic diagnosis of tuberculosis (minimal) although gastric washings and sputum were negative for tubercle bacilli by

guinea pig test. In a second case, the increased sensitivity was coincidental with the appearance of a pneumonic infiltrate which was finally diagnosed as "atypical" pneumonia. No bacteriologic studies were done. In the remaining 12 instances, chest films were uniformly negative.

It seems most reasonable to explain increasing sensitivity to tuberculin as due to increased exposure to tubercle bacilli. If this be the case, then it is also reasonable to expect that in a certain percentage of these individuals clinical lesions may occur. It may be a suggestion worth contemplation that low-degree reactors be placed in the same category as non-reactors and be retested at semi-annual intervals.

The unstable tuberculin reactors may be regarded as falling into two categories: (a) decreasing sensitivity and (b) increasing sensitivity. Decreasing sensitivity seems to be correlated with a healing of the foci of infection originally responsible for the hyper-sensitivity. In the cases of complete reversion, it may possibly indicate a biological cure; i.e., death of the tubercle bacilli in the focus. We do not consider auto-desensitization a factor in these cases because we are dealing here only with clinically well individuals and not with clinically active cases of tuberculosis. The possibility that an immune mechanism limited to the skin, as indicated by Paretzky,[10] may be involved, cannot be discounted; but we can offer no evidence from our series to support it. However, to investigate the possibility that an antibody was involved, sera from two individuals who had completely reverted were injected into the skin of the arms of two known reactors. After a waiting period of two hours, 0.1 cc. of 1:5000 O.T. was injected into the same area and into a normal area on the other arm. Both areas gave equal degree of reactions indicating that, at least in the two individual sera tested, there were no serum antibodies which would inhibit the action of tuberculin in the concentration used.

Increasing sensitivity to tuberculin in clinically inapparent infections may be explained either on the basis of increased exposure to tubercle bacilli or to increased activity on the part of the inapparent focus. The only evidence we have to offer to support this idea is one definite case of roentgenologically diagnosed tuberculosis and one questionable case, both of which occurred coincidentally with increased sensitivity.

In the light of these findings, it would seem reasonable to take notice of increased sensitivity in tuberculosis control efforts where use of the tuberculin test is an integral part of the program.

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SUMMARY

1) Findings made as a result of a tuberculin testing program among medical students are reviewed.

2) Results indicate that in a certain percentage of reactors to tuberculin the reaction is unstable, either exhibiting evidence of increased or decreased sensitivity.

3) The causation of this phenomenon is discussed briefly.

4) It is suggested that reactors with a low degree of sensitivity to tuberculin be retested at intervals and that a marked increase in sensitivity be investigated by chest roentgenogram.

RESUMEN

1) Se revisan los hallazgos obtenidos de un programa de pruebas tuberculínicas entre los estudiantes de medicina.

2) Los resultados indican que cierto porcentaje de reactores a la tuberculina cuya reacción es inestable, exhiben ya sea un aumento o una disminución de sensibilidad.

3) La causa de este fenómeno es brevemente discutida.

4) Se sugiere que los reactores con bajo grado de sensibilidad a la tuberculina sean vueltos a probar con intervalos y que un aumento de la tuberculino sensibilidad sea investigada mediante radiografías del tórax.

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Pulmonary Diseases Service Rehabilitation Program of a Veterans Administration Hospital*

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The disabling factor of chronic pulmonary disease, particularly tuberculosis, necessitates an established program of economic rehabilitation paralleling medical rehabilitation. By the time the patient reaches the stage of arrest, his rehabilitation plan must be so formulated that he will leave the hospital adjusted to a new life, physically and economically.

Purposes of Vocational Rehabilitation

The first purpose of a rehabilitation program is to aid in the patient's emotional readjustment as soon as he is admitted by turning his depression toward a hopeful expectancy that he can get well and that he will have a successful economic life toward which a planned program of rehabilitation can now be started. During his sanatorium care, the use of his idle time for a satisfying, productive activity leading to his new future will relieve much of his discontent and will prevent many patients from leaving the hospital against medical advice.

The second purpose of economic rehabilitation is to prevent a future physical breakdown of the patient by assisting in the evaluation and preliminary training of a vocation suitable to his disease and tested work tolerance. It is obviously wasteful of costly hospital beds to have patients spend many months reaching an arrest status only to be forced to return within a short span of time because of too strenuous work.

A third function of this program is to test the patient's work tolerance during his ambulatory phase of treatment. For a tuberculous patient, testing his physical tolerance in work approximating as closely as possible the work he will perform after discharge is more informative than using an artificial factor such as an hour's walking exercise.

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A fourth important function is to prevent deterioration of mental abilities and competitive capacities due to prolonged hospitalization. The need for this is emphasized by previous experience with patients not so rehabilitated and by the experiences of a large percentage of those patients who found that they could not suddenly return to competition with students or workers whose training had not been interrupted.

Hospital Facilities

Vocational Advisement and Guidance: This department has the work of testing interest and personality for marked aptitudes, interviewing the patient to help him determine his vocational goal, initiating a planned prevocational training in the hospital and assisting the patient to enter his vocational training before his discharge by arranging for schools and job training and processing him under the public laws regarding training and subsistence. This assistance is maintained after the patient leaves the hospital and is undergoing his training through the medium of a vocational advisor appointed for him in his area. The patient should have this service before any courses or other training is started in order that his energies may be used toward a planned goal and not used in an aimless pattern of which he soon tires.

Occupational Therapy: This may be considered the first step in the patient's rehabilitation and may be started in the interval between recovery from toxemia or complications and the return of strength sufficient to start prevocational study. This can provide him with diversion, exercises for manual dexterity, or stimulation of his interest in accomplishment. By indicating for which purpose this service is desired, the doctor can increase the effectiveness of the occupational therapist's assistance. This stage should not be prolonged to the detriment of educational therapy, nor should monetary gains from occupational therapy products preoccupy the patient to the extent that further training is obstructed.

Educational Therapy: This department furnishes instruction to the patient in the pre-ambulatory stages by individual tutoring at the bedside, in small group classes in the ward as permitted by the doctor, and by supplying and supervising correspondence courses for review, college credits and specialized subjects not covered otherwise. After the patient has reached semi-ambulant status, instruction is given in class rooms.

Manual Arts Therapy: There are many well equipped shops for the early training of patients along manual lines, but this should not be started until the patient has reached ambulant status. Instructions in the theory of electronics, engineering principles,

printing and bookbinding, shop mathematics, and use of precision instruments may be given non-ambulant patients at the bedside or in group classes.

Social Service: This department cooperates closely in this program by assisting the patient in any personal problems which may interfere with rehabilitation, either in the hospital, or after he is discharged, through field representatives. This department may be called upon to assist veterans who are not eligible to rehabilitation through Federal public laws but may be eligible for training under their state laws. Such patients should receive vocational advisement and in-hospital training from the hospital facilities. The Social Service department can also be an important link between the out-patient examiner and the patient's job or school advisor if any changes in his condition necessitate curtailment of the patient's activity.

Special Service: In correlation with educational activities, this department supplies volunteer workers to instruct special subjects such as music-theory and composition, art, short story writing. Staff workers are assisting in the elementary basic education program by awakening interest in spelling and English by supplying and organizing games, such as puzzle programs and spelling bees.

Plan of Operation

The course of the rehabilitation program is controlled through the direction primarily of the patient's physician and the vocational advisor. The patient's physician initiates, evaluates and controls all of the rehabilitation activities of his patient. The vocational advisor evaluates the patient's vocational interests and inherent or developed capabilities from the time of his admittance until his discharge. Progressive steps of in-hospital training are planned to lead to a final goal of emotional adjustment and successful economic life.

Medical Supervision: A Medical Coordinator of Rehabilitation has the duties of orienting the physicians as to the purposes and activities of the rehabilitation department; to see that necessary information between the medical and rehabilitation services is cleared promptly; to set up monthly rehabilitation conferences which he attends in an advisory capacity, and to transmit to the patient's physician and rehabilitation units any pertinent suggestions to improve the program.

The patient's physician must regard the evaluation of the patient's post-hospital capabilities and his economic rehabilitation as an integral part of medical therapy. He should constantly supervise, initiate and specifically prescribe the activity limits of the patient's rehabilitation program in the hospital. He must

inform the vocational advisor concerning the feasibility of the patient's present occupation and tentative vocational objectives. He must also, during ward rounds, inspect the patient's rehabilitation activities and records of accomplishment in order to advise the patient and to prescribe further rehabilitation work specifically as to time limits. In the monthly rehabilitation rounds, he must make the decision as to the further steps of rehabilitation. When the patient is ready for discharge, he must forward the patient's final evaluation to the vocational advisor. This includes the conditions under which the patient may work or study and the number of hours of work or units of study the patient may undertake during the immediate post-hospital period. This information is also included in the discharge summary so as to be available to the out-patient physician and the post-hospital training office.

Vocational Advisement: The initial vocational advisement interview is accomplished in the admitting ward as soon as the physician indicates that the patient's condition permits a half-hour interview. It should be just comprehensive enough to show the general trend of the patient's goal and capabilities and to indicate educational deficiencies that may be cleared in the hospital. The advisor at this time indicates briefly in a screening summary the tentative hospital training advised under one of the following broad patterns:

1) Basic: English, mathematics, spelling, writing; this should lead, if possible, toward a high school diploma and deficiencies should be indicated.

2) Mechanical: may indicate specific needs, such as occupational therapy, manual arts therapy, or exploratory work.

3) Academic: for sub-professional technical study, business fields, or general exploration—may advise special occupational therapy, orientation courses or business courses such as bookkeeping, shorthand or typing; drafting.

4) Professional: any vocation requiring a college degree, such as law, medicine, dentistry, accounting, architecture, social service, agronomy, business administration.

In the screening process, those patients found to have already a vocation deemed feasible by the physician and advisor are so indicated and the full advisement procedure does not need to be applied. Some patients, because of age or obvious physical incapacity determined by the physician, are also taken from the complete advisement roll. Further advisement progresses in the bed rest wards as the need is shown in the monthly rounds or when the patient reaches a semi-ambulant status. At this time, further information has been obtained from the patient's ability in studies

already performed and his reaction to exploratory literature which has been furnished in regard to various trades and professions. In this period, weekly advisement with patient groups is advantageous in enlarging the scope of the advisor's activity and promoting patient interest in the tests. Final advisement work is best done with the ambulant patients by individual appointment.

In-Hospital Training: For the development of the patient's program, the education and manual arts sections, having been notified by the vocational counselor that initial advisement has been completed, act separately or conjointly to initiate training as indicated by the advisor and prescribed by the patient's physician.

The Education Section is responsible for:

1) Basic subjects of English, arithmetic, spelling and writing. This is for the patients whose educational deficiencies preclude high school work or whose language difficulties must be solved before further training can be continued.

2) High school subjects leading to a diploma: This is preceded by general education development tests which will determine what deficiencies must be met to receive a diploma. The instructors in this section are certified by the Los Angeles Board of Education and credits given by them are acceptable for the diploma granted by the Van Nuys Evening High School. In this manner, during the past two and one-half years over 200 of our patients have graduated in high school at a formal commencement exercise held in our auditorium.

3) Business subjects such as shorthand, bookkeeping, typing, business English and letter writing. Some specialized subjects must be taught by supervised correspondence courses.

4) Advanced studies for college level students and those already trained in professional vocations. These are furnished by supervised correspondence courses, text books for self study or technical journals which the patient is instructed to request from the librarian visiting the wards.

5) Foreign language instruction: This is presently furnished in Spanish, German and French. Supervised correspondence courses may be used by staff teachers if other languages are needed for college entrance.

6) Correspondence courses are supervised by an education department instructor with definite time limits set for completion of each section. It is important that the patients schedule definite time periods for correspondence work and that the instructor supervising the course sets definite work production levels. The instructor at intervals sees each patient enrolled in such courses to assist and to evaluate progress.

The Manual Arts Section is responsible for:

1) Pre-shop instruction which may be given at the bedside or in ward group classes. In many instances, exploratory assistance is given by means of industrial pamphlets and elementary texts in various fields. In this way, interests are developed and clarified which enables the vocational advisor to evaluate further the patient's vocational objective. Bedside classes in theory and primary applications of manual arts subjects, such as electronics, small instrument manipulations, drafting and blueprint reading continue the patient's instruction until his physician prescribes shop training.

2) Shop training which continues the pre-shop instructions in his specific objective. In addition, the program evaluates the patient's work tolerance. His shop activities are gradually increased under the supervision of the patient's physician so that by the time the patient is discharged his tolerance will have been evaluated as sufficient to do a half day on the job training, or work in his chosen field.

The Occupational Therapy Section is used primarily to explore skills before a rehabilitation program is worked out. The type of occupational therapy should be prescribed for a definitive purpose with time limits definitely indicated. The purposes of occupational therapy are:

1) Diversional: tonic, relaxant, social or psychologic or for achievement.

2) Hobby development: usually for the older patients who cannot attain an arrest status and who do not need home industry for profit.

3) Manual dexterity development: for patients training under divisions of mechanical, technical or certain professional lines requiring manual dexterity (watchmaking, musicians, dentists, surgeons).

4) Testing: for feasibility of mechanical or technical training in vocations requiring marked manual dexterity or patience.

5) Functional: to promote active movement in extremities becoming stiff from prolonged rest.

6) Home industry development: for patients, young or old, who cannot attain arrest status, but will be stable enough to go home. These patients can neither take public training nor engage in outside industry. Projects should be diversified or skilled and have a ready and continued sales value. Possibilities are costume jewelry, photo-tinting, photo retouching, key making, show card painting, fly-tying, leather tooling, toys, gadgets, ceramics, chenille ornamental animals. Outlets for their work are either to jobbers who have special licenses or to certain organizations who use these products for presents, favors or advertisements. The local health

department must be satisfied as to the sterilization of their products.

Control of the Program

A rehabilitation record card is the basic form on which is written medical information pertinent to rehabilitation, the physician's prescriptions of rehabilitation work, the advisor's recommendations, and appointments and enrollments in classes or shops. There is also a section for the social service information concerning marital status and other non-confidential data and a final section in which the physician indicates the physical status of the patient at discharge. This folding card is kept at the patient's bedside and accompanies the patient on all his off the ward rehabilitation activities. This furnishes, with the minimum of paper work and maximum accessibility, all the current information necessary to anyone concerned with the patient's rehabilitation.

A schedule of activities is also kept in the patient's bedside folder. This contains a detailed description of permitted activities accorded each group of patients classified according to physical progress and enables the physician to emphasize to the patient the necessity of working within prescribed limits. On the reverse side is printed a weekly schedule of hours and is used by the rehabilitation instructors to enter the days and hours in which they have enrolled the patient in work. The patient also uses it to schedule definite hours for his correspondence and study periods.

Rehabilitation ward rounds are scheduled monthly by the medical supervisor and are attended by the supervisor, the patient's physician, the vocational advisor, the chiefs of the educational, manual arts and occupational therapy sections and other interested individuals such as the special service worker and the patient's ward nurse who notes dates of new appointments for the patient off the ward. In order to expedite a frank, informal discussion of the patient's interests, capability and work, the rounds are held in a central location and the necessary information is supplied by the patient's physician from the rehabilitation record card and the schedule of activities. Other information is obtained from records of the advisor and instructors. In this way, the rehabilitation activities of 450 patients can be reviewed monthly. During the rounds, deletions or additions to the patient's rehabilitation work are entered into records so that advisement and training will proceed as decided upon. The physician in his next ward rounds informs the patient of these changes and by his interest in discussion encourages the patient. In the wards for the older and the chronic tuberculous patients, rehabilitation activities are primarily in the form of occupational therapy. Fre-

quent rounds are held in which the patient's physician and the occupational therapist are in attendance. Changes in the patient's activities are decided according to the patient's progress and physical condition.

When the patient is ready for discharge, a review board is held in which the patient, his ward physician, the out-patient physician, chiefs of service and section are in attendance. At this time, the rehabilitation prescription, which will appear in the patient's final clinical summary, is discussed. In this manner, the out-patient physician becomes familiar with the patient's post-hospital plans and, when the patient returns for examination and consultation and supervision of his rehabilitation training is followed without a break of continuity. When the patient is to be followed elsewhere, the clinical summary with his future rehabilitation plan is forwarded.

CONCLUSION

A rehabilitation plan such as this can be adopted for use in tuberculosis institutions other than those in the Veterans Administration. Modifications could be in the form of increased use of municipal and state rehabilitation and educational facilities. Volunteer instructors have been helpful and their contributions could be increased in hospitals having no large rehabilitation staff. The results of such an integrated program have already been demonstrated in the reduction of emotional tensions and the lowering of irregular discharges. We believe that the patients who have completed this regimen of integrated economic and medical rehabilitation are so well adjusted and have their future life so well planned that few of them return to the institution.

CONCLUSION

Un plan de rehabilitación como este puede adoptarse para las instituciones antituberculosas fuera de las de la Administración de los Veteranos. Pueden hacerse modificaciones en el aumento gradual de las facilidades municipales y estatales para ese objeto.

Los instructores voluntarios han sido útiles y su cooperación podria incrementarse en los hospitales con escaso personal de rehabilitación. Los resultados de tal programa se reflejan en la disminución de la tensión emocional y el descenso de las salidas de enfermos en forma irregular. Creemos que los enfermos que han completado este régimen de rehabilitación médica y económica se han adaptado tan bien a su vida futura que pocos de ellos regresan a la institución.

The Shrunken Right Middle Lobe*

With Reference to the So-called "Middle Lobe Syndrome"

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Attention has been directed recently to the diagnostic difficulties frequently associated with the finding of a shrunken right middle lobe, a condition referred to by some as the "middle lobe syndrome." The following study of 16 cases of shrunken middle lobes deals with the probable cause of the condition, its diagnosis and treatment. The material does not include instances of middle lobe neoplasm, pneumonia, foreign body aspiration or tuberculosis in which the middle lobe involvement is incidental to a more widespread process.

Anatomic and Roentgenologic Considerations

The right middle lobe is separated from the right upper lobe by the horizontal fissure and from the lower lobe by the oblique fissure. Laterally, the middle lobe is in contact with the lower anterior aspect of the chest; medially, with the right side of the heart and posteriorly, with the lower lobe. The costal portion of the lobe is triangular; the cardiac portion, quadrilateral. In more than 50 per cent of instances the horizontal fissure is incomplete or absent with the result that in these the middle lobe is either partially or completely fused with the upper lobe.

Because of the obliquity of the main fissure and the fact that the middle lobe lies anteriorly to the lower lobe, roentgenologic study requires lateral as well as postero-anterior (P-A) positioning of the patient. A P-A projection does not suffice for the additional reason that if the middle lobe is shrunken, it retracts to the hilum and its place is filled with overdistended lung. On the other hand, although the lateral projection is more revealing, the contracted lobe may be obscured by densities cast by the heart and hilar structures.

If the middle lobe is diseased, as in acute bacterial pneumonia, without much loss of volume, the P-A projection reveals a prominent horizontal fissure which is slightly depressed and a diffuse density extending below and medially, the costophrenic sinus remaining clear. Should the middle lobe be considerably reduced

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in size, helpful information may be obtained by noting a shift of the heart to the right or a downward displacement of the horizontal fissure. The frequency with which calcified lymph nodes are demonstrable in the roentgenograms is quite impressive.

In the lateral projection, it is occasionally possible to discern a triangular density within a large quadrilateral mass; more often the atelectatic lobe is roughly triangular. If the middle lobe is shrunken as a result of bronchial obstruction, and its volume greatly reduced, the lobe may be represented by a narrow opacity not much wider than that of a rib. The configuration of a shrunken middle lobe is greatly modified by the shape of the thorax, the presence of pleural adhesions and the condition of adjoining lobes.

Either the lateral or medial segments of the middle lobe may be involved. Obstruction of the lateral (costal) division of the middle lobe bronchus is characterized in the P-A projection by a diffuse cloudiness extending into the lower lung field; a clear zone separates the density from the right border of the heart. In the lateral projection, the density appears triangular and is situated low and posteriorly. Obstruction of the medial (cardiac) division of the middle lobe bronchus produces in the P-A projection an irregular density immediately adjacent to the right border of the heart. In the lateral projection, the density appears quadrilateral lying immediately behind the sternum and beneath the horizontal fissures.

In addition to postero-anterior and lateral projections, supplementary procedures are often necessary, the most important being the following:

1) Lordotic View (the abdomen is brought forward, the upper back kept against the partition of the fluoroscope). In this projection, the greater mass of the middle lobe and interlobar septa are brought parallel to the plane of the central ray and a triangular shadow is brought to view. Usually the lower margin of the lobe is sharply visualized; at times, the upper as well as lower margins are seen. Roentgenograms are then taken at the desired angle for more detailed study.

2) Tomography (sectional roentgenography). Study of the lung at various depths in the right lateral position (patient lies on the right side) is apt to be most instructive. A triangular density in the lateral sections stands out in sharp contrast to a quadrilateral density in the medial sections. Tomography is therefore helpful if one suspects either the lateral or medial segments of the lobe to be involved. Each tomogram should be studied for the presence of calcified bronchopulmonary and hilar lymph nodes as well as for evidence of narrowing, distortion or displacement

of the lumina of the lobar and lobular bronchi. The interlobar fissures are particularly well visualized.

3) Bronchography. This procedure is often indicated because bronchiectasis is a frequent accompaniment of middle lobe disease. The roentgen examinations following instillation of iodized oil are made in the positions mentioned previously.

The indications for bronchoscopy will be discussed under Differential Diagnosis.

Report of Cases

Case 1: M.M., 44 years old, male; *right middle lobe shrunken and bronchiectatic.* Disease accidentally discovered during a routine x-ray inspection of the chest. Roentgenography (P-A, right lateral, lordotic): collapse of right middle lobe; tomography showed lateral as well as medial segments involved. Bronchoscopy showed small amount of thick pus, no endobronchial disease. Bronchography showed dilatation of proximal portions of both divisions of the middle lobe bronchus (Fig. 1). *Course:* No significant symptom referable to chest over a period of five years. During this time, appendix and gall bladder removed on separate occasions. Working.

Case 2: D.E., 51 years old, male; *right middle lobe shrunken and bronchiectatic.* Moderate cough and expectoration for a number of years. Roentgenogram one year previously revealed findings practically identical with those on present occasion. Roentgenography (P-A, right lateral, lordotic): collapse of right middle lobe. Bronchoscopy negative. Bronchography revealed dilatation of both divisions of right middle lobe bronchus. *Course:* Continues to have moderate cough and expectoration. Working.

Case 3: A.C., 50 years old, female; *right middle lobe shrunken and bronchiectatic.* After a seizure of pleurisy 25 years previously, developed recurring seizures of cough and expectoration. Lately, repeated hemoptyses and increase in bronchitic symptoms. Roentgenography (P-A, right lateral): collapse of right middle lobe; also fibrocalcific foci in both upper lobes and scattered foci in other lobes. Bronchoscopy negative. Bronchography showed cylindric bronchiectasis of right middle lobe. Bronchogram of left lung negative. *Course:* Because of recurring hemoptyses, lobectomy of right middle lobe. The specimen revealed cylindric bronchiectasis in a partially shrunken and fibrotic lobe. Fully recovered.

Case 4: M.W., 29 years old, male; *right middle lobe shrunken and bronchiectatic; lingula bronchiectatic.* Moderate cough and expectoration for 10 years. Past four years, recurring seizures of severe cough, wheezing and occasional fever. Roentgenography (P-A, right and left lateral, lordotic): collapse of right middle lobe, also lingula (Fig. 2); tomography confirmed findings. Bronchoscopy negative. Bronchography: Bronchiectasis involving right middle lobe and lingula of left upper lobe. *Course:* Status unchanged during past five years. Cough and expectoration more annoying during winter months. Working.

Case 5: J.O., 59 years old, female; *right middle lobe shrunken and bronchiectatic.* Pleurisy 30 years previously; pneumonia one year ago. Chronic cough and moderate pain in chest for many years. Roentgeno-

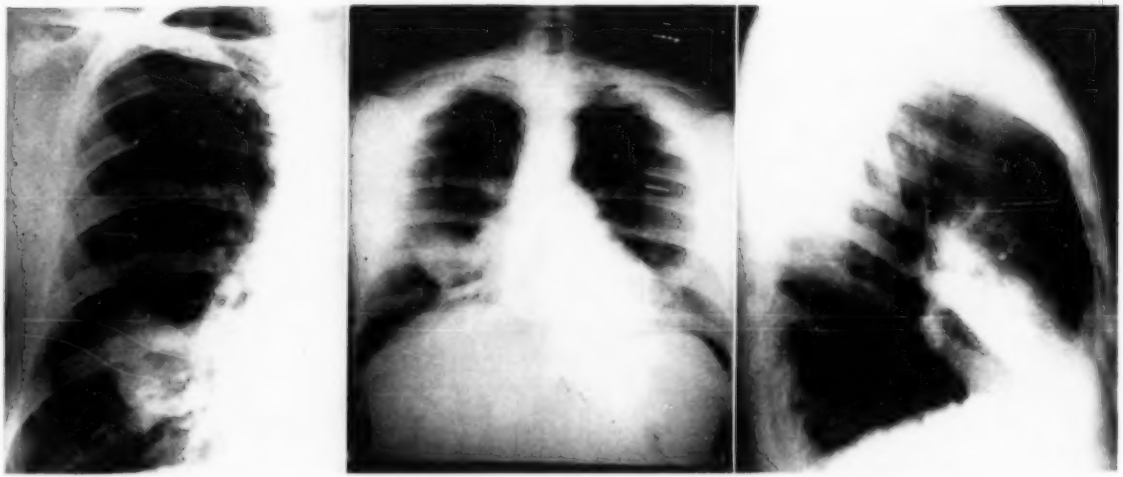

FIGURE 1A FIGURE 1B FIGURE 1C

Shrunken, bronchiectatic middle lobe accidentally discovered in a man of 44 years: (A) Postero-anterior projection: irregular density in region of right middle lobe. (B) Lordotic projection: density now triangular in shape with a well demarcated lower margin. (C) Lateral projection: irregular triangular density in region of right middle lobe.

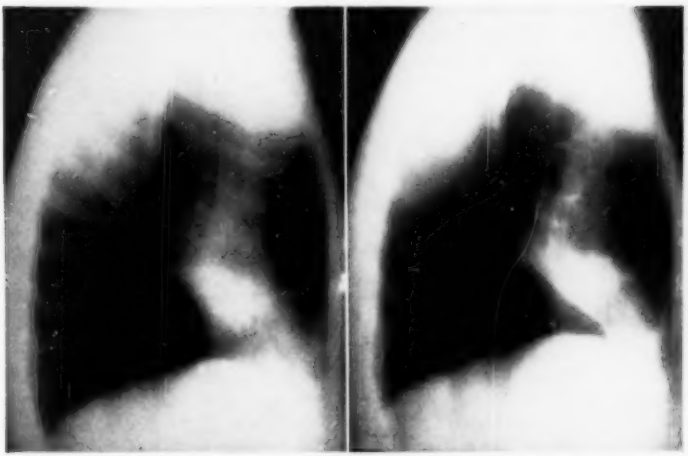

FIGURE 1D FIGURE 1E

Shrunken, bronchiectatic middle lobe accidentally discovered in a man of 44 years: (D) Right lateral tomogram: middle lobe appears as a sharply triangular density in the lateral section, becoming more quadrilateral in (E) the medial section.

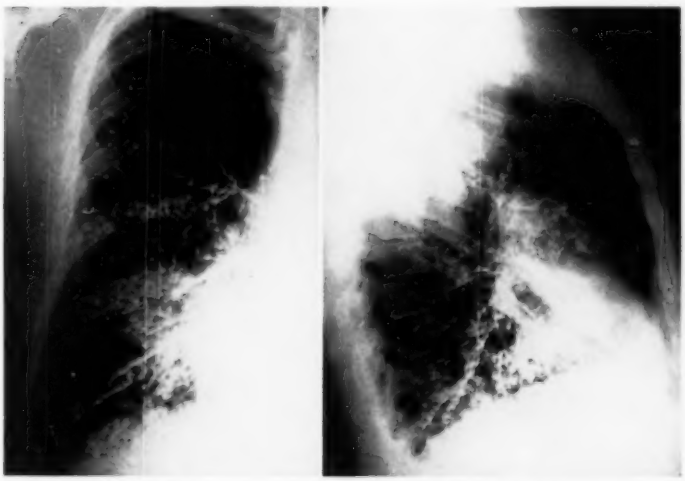

FIGURE 1F FIGURE 1G

Shrunken, bronchiectatic middle lobe accidentally discovered in a man of 44 years: (F) Bronchogram reveals dilated bronchi in middle lobe. In the lateral bronchogram (G) the proximal divisions of the middle lobe bronchus are filled with iodized oil, the distal bronchi are free of oil.

graphy (P-A, right lateral): triangular density in region of right middle lobe. Bronchography: Saccular and cylindric bronchiectasis of right middle lobe. *Course:* Status unchanged.

Case 6: A.L., 49 years old, male; *right middle lobe shrunken and bronchiectatic.* Recurring hemoptyses of 10 years' duration, punctuated by seizures of excessive cough, expectoration and occasionally severe pain in chest. Roentgenography (P-A, right lateral, lordotic): collapse of right middle lobe, also fibrocalcific foci in both apical regions. Bronchoscopy revealed hyperemia and swelling of the right main bronchus, especially marked around the orifice of the right middle lobe bronchus from which exudate was noted. Bronchography revealed saccular and cylindric bronchiectasis of right middle lobe bronchi. *Course:* Symptomatic improvement with aerosol and intramuscular penicillin. Developed right empyema which required thoracotomy and drainage. One year later, recurrence of hemoptysis necessitated right pneumonectomy.

Case 7: W.W., 64 years old, male; *right middle lobe shrunken and bronchiectatic.* Admitted to hospital in congestive heart failure; embolization and gangrene of right foot. Roentgenography (bedside): calcified focus above right leaf of diaphragm and several calcified foci at right hilum. Diffuse pulmonary congestion. Died 10 days later. Autopsy revealed shrunken bronchiectatic right middle lobe caused by strangu-

FIGURE 2: *Shrunken, bronchiectatic middle lobe and lingula in a man of 29 years.* Roentgenogram reveals a triangular density in region of right middle lobe and a sharp lower margin of the lingula on the left side. Bronchography confirmed the presence of dilated bronchi in both.

lation of bronchus by a collar of calcified lymph nodes. A calcified tuberculous focus was found at periphery of right middle lobe (Fig. 3). Calcified tubercles in spleen. Coronary thrombosis and myocardial infarction.

Case 8: B.M., 51 years old, male; *right middle lobe shrunken.* Several seizures of pneumonia and pleurisy; recurring hemoptyses and pain in chest. On one occasion, spat-up gritty material which he was told were "stones" from broken down lymph nodes. Repeated examinations of sputum failed to reveal acid-fast organisms. Roentgenography (P-A, right lateral, lordotic): collapse of right middle lobe. Tomography confirmed findings. Bronchoscopy performed two years previously reported negative. Bronchography in another institution findings unknown. *Course:* Presently at the Morrisania City Hospital where examinations of the sputum reveal acid-fast organisms.

Case 9: S.R., 21 years old, female; *right middle lobe shrunken.* Condition accidentally discovered in course of routine roentgenologic examination of chest. Had five months treatment at Seton Hospital at the age of seven years for primary tuberculosis. Roentgenography (P-A, right lateral): triangular density in region of right middle lobe. *Course:* Now in seventh month of pregnancy complicated by sickle cell anemia.

Case 10: J.H., 73 years old, female; *right middle lobe shrunken; tuberculous bronchitis.* Eight months of cough, expectoration, pain in the chest, hemoptysis and vomiting. Roentgenography (P-A, right lateral): collapse of right middle lobe. Bronchoscopy revealed mucosal swelling

FIGURE 3: *Shrunken, bronchiectatic middle lobe in a man of 64, accidentally discovered at autopsy.* Arrow points to a constricting collar of calcified lymph nodes at origin of right middle lobe bronchus. The bronchi are dilated and distally the middle lobe is collapsed and darker than the surrounding lung. At the periphery of the middle lobe there is a calcified focus (broken arrow), the remains of a healed primary tuberculous infection.

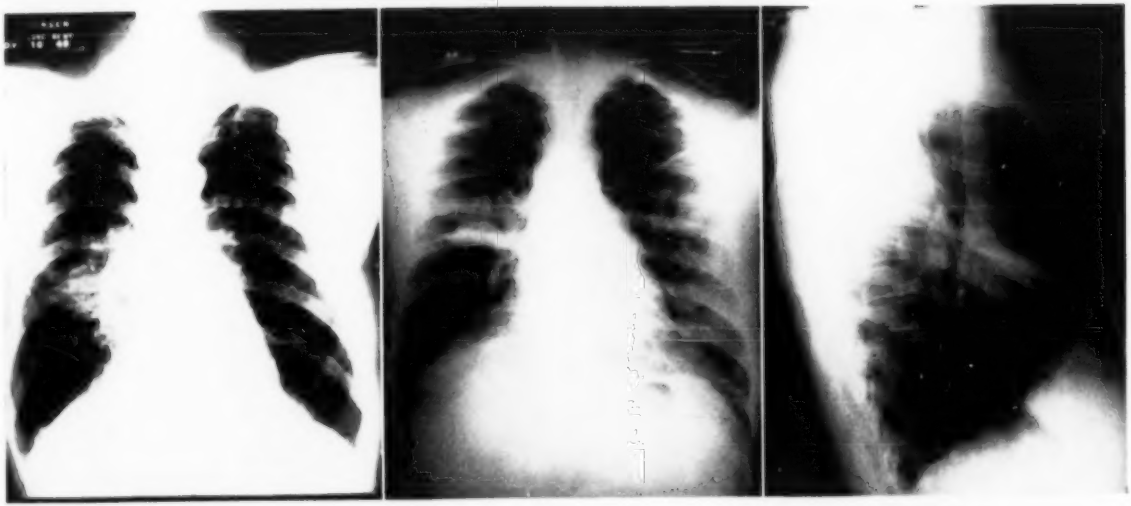

FIGURE 4A FIGURE 4B FIGURE 4C

Shrunken middle lobe; tuberculous bronchitis in a man of 56 years. Acid-fast organisms in sputum. (A) Postero-anterior projection reveals an irregular density in region of right middle lobe; circumscribed infiltration in left upper lobe. (B) Lordotic projection: the middle lobe is markedly reduced in size. (C) Lateral projection: the middle lobe appears as an elongated quadrilateral density.

and infiltration of middle lobe bronchus, swelling and redness extending into the right main bronchus. Sputum contained acid-fast organisms.

Case 11: G.T., 56 years old, male; *right middle lobe shrunken; tuberculous bronchitis.* Examined as a possible source of contact, a son of 30 having recently died of tuberculosis. Moderate cough and expectoration. Examination of sputum one year previously failed to reveal acid-fast organisms but they are now found in sputum. Roentgenography (P-A, right lateral, lordotic): collapse of right middle lobe. Bronchoscopy revealed occlusion of middle lobe bronchus with ulceration of central area of stenosis. Bronchography revealed failure of filling of the right middle lobe bronchus (Fig. 4). *Course:* Admitted to Morrisania City Hospital where, after streptomycin treatment, middle lobe lobectomy was done. Specimen revealed shrunken middle lobe with fibrocaseous foci; bronchus occluded. Uneventful recovery, sputum negative; attending Morrisania City Hospital Chest Clinic.

Case 12: R.S., 70 years old, female; *right middle lobe shrunken; tuberculous bronchitis.* Two years' cough, expectoration, pain in the chest, fever and wheezing. Roentgenography (P-A, right lateral, lordotic): collapse of right middle lobe; tomography revealed circumscribed area of highlight in superior segment of the right lower lobe adjacent to the collapsed middle lobe. Bronchoscopy showed endobronchial tuberculosis with stenosis of middle lobe bronchus. Sputum contained acid-fast organisms. *Course:* Symptomatic improvement with streptomycin. Sputum still shows acid-fast organisms. Recent spread of disease in right lower lobe.

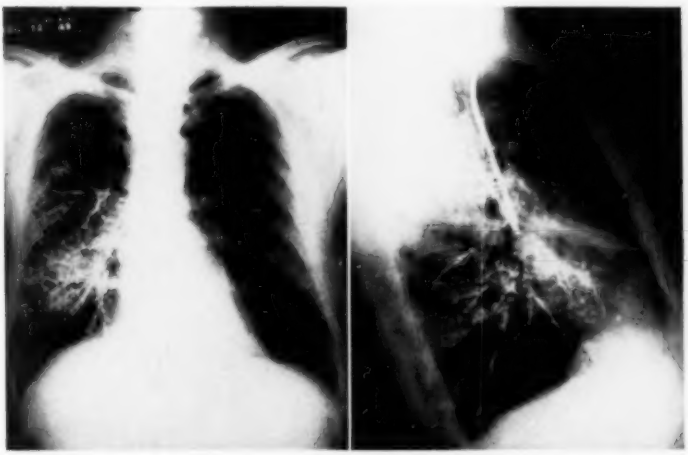

FIGURE 4D FIGURE 4E

Shrunken middle lobe; tuberculous bronchitis in a man of 56 years. Acid-fast organisms in sputum. (D and E) Bronchograms in postero-anterior and lateral projections fail to reveal iodized oil in the bronchi of the contracted lobe. Right middle lobe lobectomy done. Specimen revealed fibrocaseous tuberculosis and tuberculous bronchitis. Successful result.

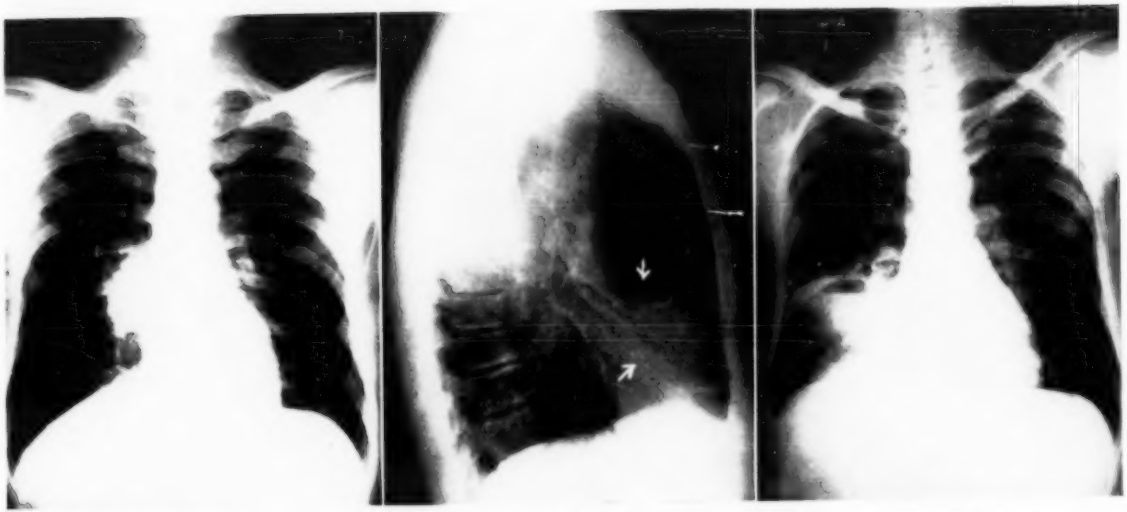

FIGURE 5A FIGURE 5B FIGURE 5C

Shrunken middle lobe, later becoming the seat of an abscess. (A) Postero-anterior projection: irregular rounded density at right hilum. (B) Lateral projection: middle lobe is somewhat reduced in size (arrows point to horizontal and longitudinal fissures seen clearly in the 14 x 17 inch film): note calcified lymph nodes in hilar region. (C and D) Ten weeks later, abscess occupying middle lobe showing fluid level. (See Figure D in following illustration).

Case 13: T.H., 40 years old, female; *right middle lobe shrunken; tuberculous bronchitis; interlobar tuberculous effusion.* Left pleural effusion two years previously followed by tuberculosis of left lung treated with pneumothorax and later thoracoplasty. Recent development of collapse of right middle lobe with encapsulated interlobar effusion. Roentgenography (P-A, right lateral, lordotic): marked collapse of right middle lobe with concave lower margin. Bronchoscopy showed granulation tissue in right middle lobe bronchus extending into the main bronchus. Chest aspiration revealed fluid containing acid-fast organisms. *Course:* Patient now in Montefiore Hospital Country Sanatorium.

Case 14: B.B., 71 years old, female; *right middle lobe shrunken; interlobar tuberculous effusion; anthracotic lymph node penetrating right middle lobe bronchus.* Seven year history of cough, expectoration, recurring fever and pain in chest. Sputum contained acid-fast organisms. Roentgenography (P-A, right lateral, lordotic): middle lobe bronchus occluded by swollen mucosa with anthracotic material penetrating into lumen. Bronchography revealed filling defect at point of origin of right middle lobe bronchus. Chest aspiration revealed fluid which contained acid-fast organisms. *Course:* Condition good, attending Montefiore Hospital Chest Clinic.

Case 15: A.G., 23 years old, male; *right middle lobe shrunken and tuberculous.* History of repeated hemoptyses. Diabetes. Acid-fast organisms in the sputum. Pneumothorax for four months, abandoned because technically ineffective. Roentgenography (P-A, right lateral): collapse of right middle lobe; several translucent areas within the shrunken lobe; tomography confirmed the above. Bronchoscopy showed the mucosa of

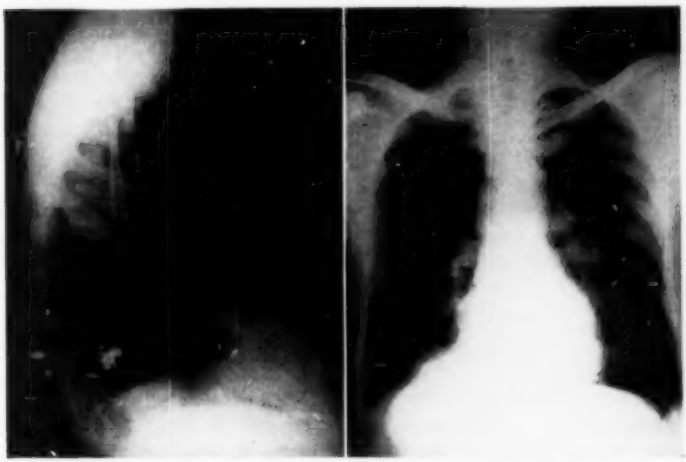

FIGURE 5D FIGURE 5E

Shrunken middle lobe, later becoming the seat of an abscess. (D) Ten weeks later, abscess occupying middle lobe showing fluid level. (E) Following middle lobe lobectomy: evidence of resection of posterior segment of sixth rib and pleural reaction at base; reexpansion of remaining lobes.

the entire tracheobronchial tree reddened with slight discharge; all orifices patent; no ulceration, granuloma or edema. *Course:* Right middle lobe lobectomy and decortication under streptomycin coverage. Specimen revealed scarred lobe with tuberculous cavitation and encapsulated caseous foci; tuberculous bronchitis. Uneventful recovery.

Case 16: H.Y., 50 years old, male; *shrunken right middle lobe; abscess of right middle lobe.* Onset with symptoms of atypical pneumonia, not responsive to treatment. Later, hemoptysis and shortly thereafter, fever, chills, cough, fetid expectoration and pain in the chest. Roentgenography (P-A, right lateral): initial films showed accentuated horizontal and longitudinal fissures with reduction in size of right middle lobe; many prominent calcified nodes at hilum. Later films revealed suppuration with abscess formation of right middle lobe. Bronchoscopy revealed mucosal redness. *Course:* After two weeks intensive penicillin treatment symptoms abated and abscess receded in size. Lobectomy and excision of a chronic organized mass. Uneventful recovery. Returned to work (Fig. 5).

Analysis of Cases

The majority of individuals with middle lobe disease, of the type described, give a history of moderate cough and expectoration dating back many years. At times the symptoms are more severe, the cough croupy and spasmodic, associated with wheezing and increased expectoration. Seldom, however, is the amount of sputum eliminated as profuse or malodorous as that commonly met in the usual forms of bronchiectasis unless there is secondary infection. A history of pain in the chest or pleurisy with effusion at an early age is often obtained. Recurring hemoptysis is a striking feature of the disease and may be the presenting symptom. Right middle lobe shrinkage may be discovered accidentally in the course of a routine roentgen inspection of the chest or during an intercurrent respiratory infection. This partly explains the fact that nine of the 16 cases presented here were seen in office practice.

As for the nature of the disease, the following are pertinent to our discussion. In six instances the lobe was shrunken and demonstrably bronchiectatic; in one (Case 7), the bronchiectasis was discovered at autopsy. In several the presence of bronchiectasis was suspected but not verified by bronchography. Iodized oil was not instilled in the bronchi of patients with active tuberculosis; in these the presence or absence of bronchiectasis was not ascertained. In five, bronchoscopy revealed a shrunken lobe associated with tuberculous bronchitis. One young man, a diabetic of 23 years (Case 15), with a shrunken middle lobe was treated with lobectomy; the excised lobe revealed tuberculous bronchitis. Another man of 56 (Case 11) had a right middle lobe lobectomy for a shrunken tuberculous lobe associated with tuberculous bronchitis.

In two of the patients with tuberculous bronchitis mentioned above (Cases 13 and 14), encapsulated serous fluid was present between the middle and lower lobes which on aspiration revealed acid-fast organisms. One patient (Case 8), expectorated what he thought was a broken tooth; his physician who had been observing the patient closely, advised him that it was a piece of broken lymph node. Two years later, acid-fast organisms were found in the sputum. One patient (Case 9), received sanatorium treatment at the age of seven years for primary tuberculous infection. Another patient (Case 11) spat up a broncholith while being prepared for a middle lobe lobectomy.

From a careful analysis of the histories, roentgen findings and course of events of these 16 patients, the evidence is strong that in each instance a preexisting tuberculous focus, probably in regional lymph nodes, led to the involvement of the middle lobe. Undoubtedly middle lobe shrinkage with or without bronchiectasis occurs as a result of pressure exerted on bronchi by cicatrizing nontuberculous lymph nodes as well as other causes. There is reason to believe that in the majority, if not all, of the patients in our study, the cause existed in pressure on and invasion of bronchi by caseocalcareous tuberculous lymph nodes and accompanying cicatrization.

Differential Diagnosis

The differential diagnosis of middle lobe shrinkage and associated changes in bronchi and pleura involves exact localization as well as determination of the nature of the disease. The history and physical findings are helpful in diagnosis but they assume much more significance after inspection of the roentgenogram.

Although roentgenography in the P-A and right lateral projections suffice in most instances to localize the disease, one often meets with difficulties. A shrunken anterior segment of the right upper lobe may be depressed by overdistended lung in the remainder of the lobe causing the affected segment to occupy the space normally taken up by the right middle lobe. It is important in such instances to examine the films, especially the lateral tomograms, for evidence of interlobar fissures. The lordotic projection which brings to view one or both borders of the middle lobe is particularly revealing. By this means it is usually possible to exclude simple enlargement of the hilar lymph nodes, pleuropericardial adhesions or an interlobar collection of fluid, the conditions with which right middle lobe disease is most often mistaken.

Encapsulation of fluid between the middle and lower lobes, or between the middle and upper lobes, seldom occurs unless there is coexisting parenchymal disease. A diagnosis of interlobar pleu-

risy is made more often than is warranted. This applies also to pleuropericardial adhesions. Free fluid in an interlobar fissure is apt to show a concave lower margin, but this does not necessarily hold if the middle lobe is markedly contacted and the fluid hugs closely the collapsed lobe. The roentgenographic appearance of a shrunken middle lobe may also be simulated by a triangular density formed by the superimposed lower cardiac border and an elevated right leaf of the diaphragm. By using the several diagnostic modalities mentioned previously, the disease can be usually localized with a high degree of accuracy.

Bronchoscopy is indicated in the differential diagnosis of a shrunken right middle lobe for the reason that many individuals, the majority in our series, are of the cancer age and bronchiogenic carcinoma has to be excluded. In the case of relatively young individuals, a history of recurring hemoptyses associated with spasmodic seizures of cough and wheezing suggests the possible presence of bronchial adenoma. An additional indication for bronchoscopy is a history of repeated pneumonia or pleurisy. In these, one has to rule out bronchial obstruction caused either by a foreign body or by extrabronchial compression of one form or another. Bronchoscopy was done in 13 of the 16 cases. At the time of bronchoscopy, material is obtained for bacteriologic examination and for study of cellular elements. A biopsy is also taken for histologic study. The bronchoscopist should be prepared to encounter irregular calcified masses penetrating the mucosa or lying freely (broncholiths) within the bronchial lumen. These "lung stones" are due to calcified lymph nodes ulcerating and eroding into a contiguous bronchus.

The frequency with which tuberculous bronchitis is encountered in patients with middle lobe disease is remarkable. The bronchial involvement may take the form of ulceration or diffuse mucosal swelling and redness. It often affects the right main bronchus and is most pronounced at the orifice of the right middle lobe bronchus. In none of the cases studied was a broncholith found on bronchoscopy. In one instance (Case 14), bronchoscopy revealed an anthracotic lymph node penetrating the bronchus but no free "stones" within the lumen. However, on other occasions we have encountered in one instance a broncholith within the right upper lobe bronchus; in another, within the right lower lobe bronchus and in a third, within the bronchus supplying the lingula.

Bronchography serves the purpose of demonstrating the presence or absence of bronchiectasis or of bronchial obstruction beyond bronchoscopic view. As occurred in several of our patients, stenosis of the middle lobe bronchus was not seen endoscopically,

yet iodized oil revealed distal obstruction. Four of our patients showed variable degrees of cylindrical or saccular bronchiectasis and in one there was involvement of the lingula as well as of the right middle lobe bronchus. In two patients with tuberculous bronchitis, the iodized oil failed to enter the shrunken lobe.

Treatment

Middle lobe disease of the type described is best treated by resection unless the age or condition of the patient are contraindications. The presence of active tuberculosis requires thorough preparation with streptomycin and adjuvant measures before surgery is undertaken. Surgical treatment is more urgent in patients who have frequent episodes of pneumonia or recurring hemoptyses or superimposed suppuration or empyema. In these, preoperative treatment with antibiotics, both locally and systemically, as well as supportive measure are of great importance.

One of the patients treated surgically (Case 16), developed a nontuberculous abscess in the partially collapsed middle lobe after several months of cough, wheezing, hemoptysis, fever and recurrent seizures of chest pain. After two weeks of penicillin treatment the symptoms abated and the abscess reduced in size. The patient was treated by right middle lobe lobectomy and made an uneventful recovery. Another patient (Case 6), had recurring hemoptyses for a period of 10 years. He developed an empyema which was drained surgically. However, recurrence of copious hemoptyses a year later, necessitated a right pneumonectomy because technical difficulties prevented resecting the middle lobe alone. The third patient, a woman of 50 (Case 3), had a right middle lobe lobectomy for recurring hemoptyses. The patient made an uneventful recovery.

A shrunken middle lobe which is the seat of active tuberculosis, especially if associated with tuberculous bronchitis, presents many difficulties in treatment. Sooner or later evidence of tuberculosis is found in other parts of the lungs, if not already in existence, so that one is dealing with a multilobar disease of serious nature. One utilizes sanatorium treatment, streptomycin and whenever feasible, some form of surgical treatment. If conditions are favorable resection of the diseased middle lobe may be successfully employed as was done in the following instances. This patient (Case 15), a diabetic man of 23, had a shrunken tuberculous middle lobe for which pneumothorax proved ineffective. Under streptomycin coverage, it was possible to resect the middle lobe and at the same time decorticate the remainder of the lung which was bound down by a fibrous membrane. The patient made an uneventful recovery. Another patient of 56 (Case 11) had a suc-

cessful excision of the middle lobe which was the seat of fibrocaseous tuberculosis and tuberculous bronchitis.

Discussion

Nelson, Brock and others have shown that the bronchus to the right middle lobe, more so than any other, is subject to compression by enlarged or cicatrizing lymph nodes. As a result, the right middle lobe is particularly vulnerable to collapse. In explanation, these authors drew attention to the fact that the right middle lobe bronchus, as it leaves the main channel, forms an acute angle. At the point of bifurcation the bronchus is surrounded by a chain of lymph nodes which drain the lymphatics not only of the middle lobe but also of the lower lobe. When these bronchopulmonary lymph nodes become involved, they are apt to exert pressure on the middle lobe bronchus. Should the bronchial channel become obstructed, the lobe collapses leading in many instances to bronchiectasis. Bronchiectasis has been observed repeatedly in children who have gone through the primary infection with the tubercle bacillus, especially in those who have had signs of bronchial compression. It is noteworthy that the middle lobe is most often involved in such instances.

Case 7 is particularly instructive. The patient, a man of 64 years, died of coronary thrombosis and myocardial infarction. At autopsy, the right middle lobe was found shrunken and bronchiectatic caused by strangulation of the middle lobe bronchus by a cicatrizing collar of calcified lymph nodes. A calcified primary focus was present at the periphery of the right middle lobe (Fig. 3A). The presence of calcified tubercles in the spleen was additional evidence that the condition in this particular instance was the end result of a healed primary tuberculosis.

It should be emphasized that enlargement of lymph nodes in primary tuberculosis occurs irrespective of the lobe involved. The resulting collapse may affect the right upper lobe, the left upper or lower lobes or a combination of lobes, even the entire right lung or the entire left lung. The predilection of the entire left lung to collapse is ascribed to the fact that the left tracheobronchial glands are in a position to obstruct easily the left main bronchus. One lymph node lying between the bronchus supplying the lingula and that of the lower lobe is in a particularly strategic position. The predilection of lingular involvement when bronchiectasis involves the left lower lobe may find an explanation in this circumstance.

There is no need to designate the condition of right middle lobe collapse a syndrome because an anatomical peculiarity renders this lobe especially vulnerable to bronchial obstruction, no more

than the term "epituberculosis" should be used when the right upper lobe is involved. The mechanism is identical in all forms of pulmonary collapse due to bronchial obstruction by lymph nodes.

Collapse of one or more lobes or an entire lung and accompanying sequelae, caused by compression of bronchi by calcified tuberculous lymph nodes, is only one facet of the disease the ramifications of which are much more profound. What is not sufficiently realized is the fact that the sequelae of lymph node enlargement may not only appear at a time or shortly after the first infection with the tubercle bacillus but at any time during the life-time of the individual. Of the 16 patients analyzed in this study, 13 were 40 years of age or over. In this respect our experience is unique since most of the reported instances of "lobar collapse," "absorption collapse" or "atelectatic bronchiectasis," followed primary tuberculosis in children.

Certain fundamental aspects of the problem, which can only be touched upon here, concern the frequency with which dormant caseo-calcareous foci in bronchopulmonary and tracheobronchial lymph nodes give rise to exacerbation of tuberculosis, by one or another avenue of dissemination, during the life-time of an individual. Physicians of the "endogenous" school give considerable weight to this form of onset of tuberculosis in the adult. Unexplained pleurisy with effusion in later years, even empyema without obvious cause, tuberculous pericarditis or tuberculous bronchitis with minimal pulmonary involvement probably represent regional spreads of the disease from tuberculous lymph nodes. Fistulization may take place between pleura, bronchi, esophagus and chest wall; at times, adhesive mediastinitis with obstructive or traction phenomena on adjacent organs. Some forms of bronchiectasis are occasionally due to bronchial obstruction by bronchopulmonary lymph nodes. A dramatic event, and one not at all uncommon, is the expectoration of broncholiths or "lung stones" which is often preceded by a bout of severe cough and hemoptysis. Although there are times when the diagnosis of the above mentioned presents difficulties, the probable course of events is easily reconstructed once tuberculosis is suspected.

SUMMARY

Of all the lobes, the right middle is most subject to collapse. This is due to the fact that the middle lobe bronchus is especially vulnerable to compression and invasion by bronchopulmonary lymph nodes, the latter draining the lower as well as the middle lobe. An analysis of 16 cases of shrunken middle lobes reveals the cause to lie in cicatrizing tuberculous lymph nodes constricting the middle lobe bronchus. In some, the shrunken lobe is the seat

of bronchiectasis; in others, there is tuberculous involvement of the bronchus and lobe. The significance of the existence of dormant caseocalcareous bronchopulmonary lymph nodes in the pathogenesis of several tuberculous and nontuberculous conditions is discussed.

The symptoms referable to shrunken middle lobes are of a bronchitic nature punctuated by acute seizures due to intercurrent pulmonary infections or hemoptysis. The relatively mild course of the disease, in most instances, accounts for the fact that the condition is often encountered in office practice. It is usually overlooked or erroneously ascribed to pleuropericardial adhesions or interlobar pleurisy. The diagnosis can be made by roentgenography in the postero-anterior, right lateral and lordotic projections. The shrunken lobe appears as a triangular or roughly quadrilateral density at the root of the lung. Tomography is helpful. Bronchoscopy is essential in determining whether or not one is dealing with bronchiogenic neoplasm. Bronchography is necessary to establish the presence of bronchiectasis. Definitive treatment consists of excision of the involved lobe unless the age and condition of the patient contraindicate surgery.

RESUMEN

El lóbulo medio derecho es el más sujeto de todos al colapso lo que es debido al hecho de que es especialmente susceptible de sufrir compresión e invasión, por los ganglios linfáticos que canalizar tanto el lóbulo inferior como el medio.

Un estudio de 16 casos de lóbulo medio retraído revela que la causa radica en los ganglios linfáticos en proceso de cicatrización que comprimen el bronquio del lóbulo medio derecho.

En algunos casos hay bronquiectasia en ese lóbulo; en otros hay invasión tuberculosa del bronquio y del lóbulo. La significación de la existencia de ganglios calcareo-caseosos en la patogenia de algunos padecimentos tuberculosos o no tuberculosos, se discute en este artículo.

Los síntomas atribuibles a lóbulo medio retraído son de naturaleza bronquítica con acentuación durante episodios agudos debidos a infecciones pulmonaers o hemoptisis. El curso relativamente benigno en la mayoría de los casos, explica que estos casos se ven a menudo en la práctica de consultorio. Habitualmente es pasado por alto o erroneamente se atribuye a adherencias pleuropericárdicas o a pleuresía interlobar. El diagnóstico puede hacerse por radiografía en posteroanterior, lateral derecha o en lordosis.

El lóbulo retraído aparece como una sombra triangular o toscamente cuadrangular en el pedículo del pulmón. La tomografía es muy útil.

La broncoscopía es esencial para determinar si se trata o no de una neoplasma. La broncografía es necesaria para establecer la presencia de bronquiectasis. El tratamiento definitivo consiste en la extirpación del lóbulo comprometido a menos que la edad u otras condiciones contraindique la cirugía.

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Experimental Massive Pulmonary Collapse*

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Interest in atelectasis has in recent years been revived by the increased recognition of its frequency. It has been demonstrated that complete obstruction of the air passage supplying a unit of the lung which does not also communicate with another air passage will produce atelectasis.[1-3] It has been shown[4] that this is due to absorption by the body fluids of the gases contained in that part of the lung.

The process of collapse of a lung following complete bronchial obstruction consumes a considerable amount of time, but in some cases of undoubted atelectasis the collapse occurs quite rapidly.[5,6] For this reason, and because bronchial breath sounds may sometimes be heard over the dull area, it has been hypothesized that collapse of the lung may occur rapidly from causes other than compression of the lung or bronchial obstruction.[7] What these causes are has not been explained. Jackson[8] has suggested that rapidly occurring atelectasis is due to the presence of a one way valve in the bronchus, and states that he has seen bronchoscopically such valves in action. The objection has, however, been made that an obstruction would in every case cause absence of breath and voice sounds and diminished tactile fremitus over the affected area.

The anatomy of the respiratory tract does not seem to fit in with the idea of active collapse, but rather with the conception of passive collapse. The muscle fibers are arranged in a geodesic network around the bronchi and bronchioles, terminating in sphincters at the entrances to the alveoli,[9] and their contraction cannot collapse the lung. These muscle fibers do not surround the alveoli and are not present in the human pleura.[10] The elastic fibers, on the other hand, are arranged in the longitudinal axis of the bronchial tree, for the most part, and surround the individual alveoli. They are present in large numbers in the pleura.[9] This arrangement is an ideal one for expelling air from the lung, and this is in fact its purpose, the expulsion of tidal air being largely accomplished by this tissue during normal respiration. Elastic tissue, of course, has no power of active contraction.

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If the muscle fibers of the human respiratory tract can completely occlude the bronchial tree by their contraction, an atelectasis might eventually be produced by a long continued spasm, if death from asphyxia did not occur first. It has been pointed out already, though, that the muscle fibers do not surround the alveoli or exist in the pleura, so the air in the alveoli would be trapped rather than expelled, and the atelectasis would be of the slowly appearing type seen in complete bronchial obstruction. It is common knowledge that spasm of the bronchial musculature causes difficulty in expiration rather than collapse of the lung.

It being therefore evident that it is difficult to correlate the idea of active pulmonary collapse with the physical mechanics of respiration or with the anatomy of the lung, I set out to de-

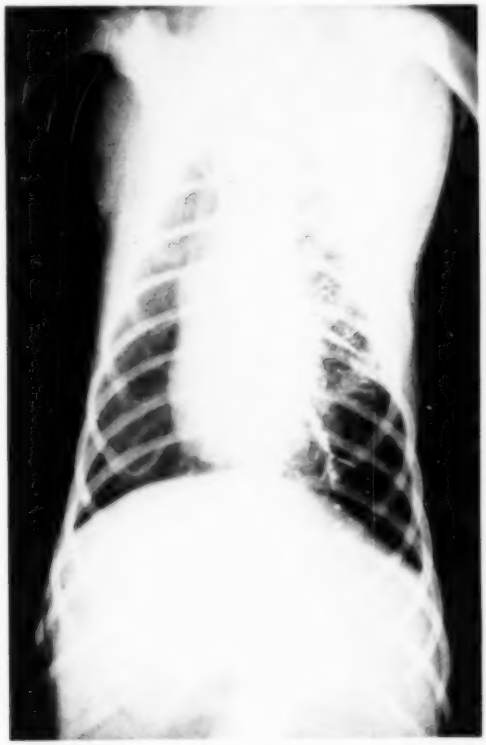
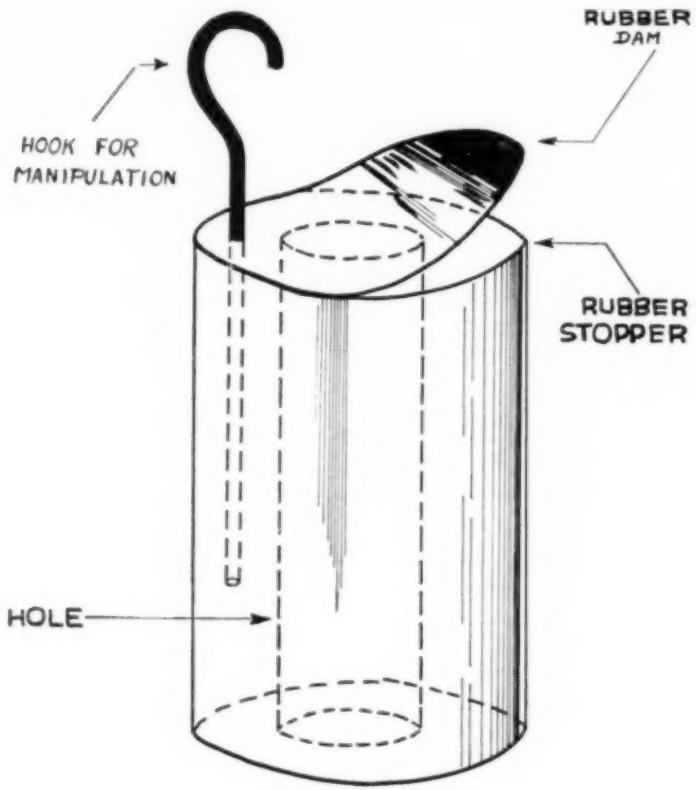


FIGURE 1: Roentgenogram 40 minutes after insertion of plug in right diaphragmatic lobe bronchus.

termine the validity of the one way valve conception of rapid pulmonary collapse.

A 10 kilogram dog was anesthetized with nembutal and the bronchial tree inspected bronchoscopically in order to be certain that no abnormality was present. A roentgenogram of the lungs and a bronchogram were made to rule out the possibility of pre-existing pulmonary lesions. A rubber plug was then inserted into the main bronchus of the right diaphragmatic lobe. It was



ONE-WAY VALVE (SCHEMATIC)

Fig. 2

found that after 40 minutes no perceptible collapse has occurred (Fig. 1). This was in agreement with the results of previous investigators.

A valve permitting air flow in one direction but not in the other was constructed (Fig. 2). It will be noted that this is not nearly as perfectly functioning a valve as was used by Van Allen and his co-workers. This type of valve was used because in our opinion perfectly functioning, air tight, one way valves rarely are formed accidentally in the lung. A 10 kilogram dog was anesthetized with nembutal and a roentgenogram of his lungs made (Fig. 3). Bronchography was not performed on this animal in order that the opaque media might not interfere with radiographic study of the lungs. The bronchi were inspected bronchoscopically and the valve inserted in the left main bronchus in such a way that air could escape from the lung but could not re-enter it. Four minutes after the insertion of this valve (as soon as was possible) a roentgenogram of the lungs was made (Fig. 4). Mediastinal shift to the left and collapse of the left lung were already present. Thirteen minutes after insertion of the valve the collapse of the left lung and mediastinal shift had increased. Roentgenograms made 24 minutes (Fig. 5) and 49 minutes after insertion of the valve showed increasing collapse of the left lung and increasing mediastinal shift, so that collapse was nearly complete at the end of 49 minutes.

Other similar experiments demonstrated an interesting phenomenon. Sometimes atelectasis would not occur for a considerable time, due to the inefficiency and unreliability of the valve used. When it did finally occur, though, the collapse was quite rapid, as in the experiment described above. This sequence of events was obviously the result of the valve's beginning to work properly, and answers the question of how a one-way valve can suddenly develop in the bronchus. It is merely a case of a potential valve becoming an actual one.

Being satisfied that a one-way valve could produce rapid pulmonary collapse, I attempted, by physical examination of the experimental animals, and variation in the location of the obstruction, to determine why bronchial breath sounds are heard over areas of atelectasis in some cases. It was found that the breath sounds of these animals were not similar enough to those of humans for any conclusion to be drawn. Bronchial breath sounds were heard over the atelectatic areas, but the normal breath sounds of dogs contain so pronounced a bronchial element that we considered these findings to be inapplicable to humans. It was therefore necessary to wait for such cases to appear in the hospitals and determine the reasons in each case.

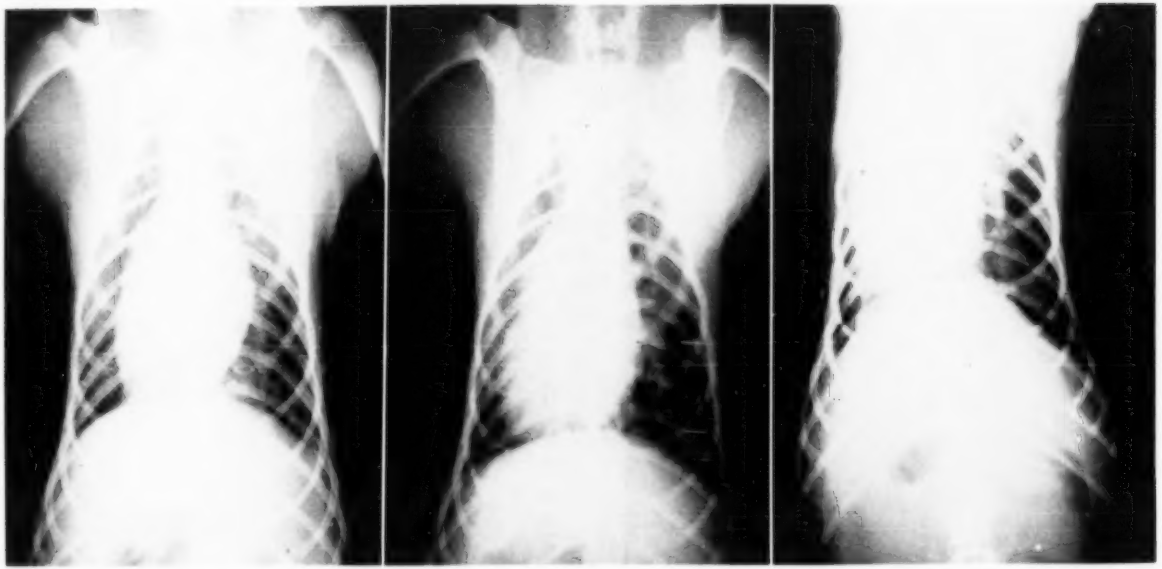


FIGURE 3 FIGURE 4 FIGURE 5

Figure 3: Roentgenogram before insertion of one-way valve.—*Figure 4:* Roentgenogram four minutes after insertion of one-way valve.—*Figure 5:* Roentgenogram 24 minutes after insertion of one-way valve.

In a series of over 3,000 cases in which there was radiographic evidence of pulmonary abnormality only two clear cut cases of atelectasis with transmission of bronchial breathing were noted, cases of compression atelectasis being disregarded. In one of these the bronchus supplying the right upper lobe was completely occluded. Bronchial breath sounds were transmitted in this case from the trachea into the airless lung tissue and thence to the chest wall.

In the second case the left lower lobe bronchus was occluded and the left lower lobe consequently atelectatic. The left upper lobe was extensively diseased, and bronchial breath sounds were transmitted from it through the lower lobe to the chest wall.

Many cases were seen in which atelectasis and pneumonitis coexisted in the same lobe, and in which bronchial breath sounds were heard, but the difficulty of accuracy of observation in such cases made it impossible to use them in the series. The observations of Van Allen and his co-workers on collateral respiration are of importance in such cases.[1-3]

Many cases of postoperative pneumonia show radiographic evidence of complete or partial atelectasis. Several factors contribute to bronchial obstruction in such cases. There is abundant opportunity for aspiration of secretions. Respiratory movements are lessened and the cough reflex abolished, and finally, manipulation of the abdominal viscera causes reflex contraction of the bronchi.[11]

When a bronchus becomes occluded, normal drainage cannot occur, and pneumonitis begins.[12] Collateral respiration is cut off by the pneumonitis, and atelectasis results. If chemotherapy or antibiotic therapy is instituted, the pneumonitis may clear up, collateral respiration be re-established, and a normal x-ray picture be seen, even though the obstruction is still present. It is important to remember that although atelectasis is evidence of bronchial occlusion, absence of atelectasis is not evidence of a patent bronchus. Bronchoscopy should never be cancelled because the physical signs of obstruction have disappeared.

In view of these observations, I feel that if atelectasis without bronchial occlusion ever occurs it must be excessively rare. Every case of atelectasis should be bronchoscoped, regardless of the presence or absence of what are usually considered to be signs of bronchial occlusion. Atelectasis itself is evidence of bronchial occlusion.

The author wishes to express his appreciation of the assistance of Dr. D. W. Chapman in the animal experiments, and of the many helpful suggestions of Dr. J. A. Greene.

SUMMARY

1) It has been demonstrated that occlusion of the air passage supplying a unit of the lung which does not also communicate with another air passage (by collateral respiration) will result in atelectasis by absorption of the trapped air.

2) Some cases of atelectasis occur with a rapidity which would preclude absorption of the trapped air as a cause. Since the anatomy of the lungs and the dynamics of respiration make any cause of collapse other than bronchial obstruction unlikely, experiments were performed to determine whether a valvular obstruction would produce rapid atelectasis. It was found that a one-way valve properly placed in the bronchus did produce rapid collapse of the corresponding portion of the lung.

3) The author believes that practically all cases of atelectasis can be explained on the basis of bronchial obstruction.

RESUMEN

1) Se ha demostrado que la oclusión de la vía de aire de una parte del pulmón que no comunica con otra parte del pulmón por respiración colateral, dá por resultado la atelectasis por absorción del aire atrapado.

2) Algunos casos de atelectasis ocurren con una rapidez que descarta la posibilidad de la absorción como causa.

Puesto que la anatomía de los pulmones y la dinámica respiratoria eliminan toda otra causa que no sea la obstrucción bronquial, se hicieron experimentos para determinar si obstrucción valvular produce rápidamente atelectasis. Se demostró que la válvula de sentido irreversible colocada adecuadamente en el bronquio, produce colapso rápido en la región correspondiente.

3) El autor cree que prácticamente todos los casos de atelectasis pueden explicarse por el mecanismo de la obstrucción bronquial.

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Benign Thymic Cyst: A Case Report

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Non-neoplastic thymic cysts of sufficient size and proper location to produce signs and symptoms appear to be rare. Smart[1] reported such a case in which the cyst, in the anterior mediastinum, measured 8 x 5 x 5 cm. The cyst was attached at it's upper pole to a firm mass in the suprasternal space. Microscopic section revealed the mass to be thymic tissue containing typical Hassell's corpuscles. Hyde, Sellers and Owen[2] recorded a unilateral cyst of the thymus which presented itself in the neck of a five year old child. This cyst measured 7 x 5.5 x 3.2 cm. Fridjohn[3] added the report of a large cyst occurring in the thymus of a one day old infant.

The mass in the case reported here measured 11 cm. in diameter and produced an increasing cough and mild shortness of breath. The cyst, arising in the anterior mediastinum and attached to the superior pericardium, had pushed into the left pleural space, carrying pleura and lung before it.

History

Mrs. C. F., a 40 year old negro housewife, was referred from the Hahnemann Hospital medical clinic to the chest clinic on February 3, 1948, because of x-ray evidence of an intrathoracic tumor.

Present Illness: She claimed to have had a cough since birth which was worse during upper respiratory infections and was for the most part non-productive. Since January 1947, upper respiratory infections became more frequent, and the cough more severe. Mild dyspnea on exertion and during "colds" had been present for the past two or three years. Because of these complaints, she sought treatment in the out-patient department. The first x-ray inspection of the chest that she could recall was taken January 14, 1948, and she was referred to the chest clinic for study.

Family and Past History: The family history was non-contributory. The past history contained no episodes of pneumonia, pleurisy, hemoptysis, wheezing or chest pain. Operation for perirectal abscess was performed in 1924. Venereal disease was denied.

Physical Examination: The patient was an obese, middle-aged, cooperative negress without obvious evidence of acute or chronic illness. Temperature, pulse and respirations were normal, blood pressure 118/80, and weight 176 pounds. The only abnormality revealed on complete physical examination was inconstant wheezing heard posteriorly over the right lower lobe.

X-Ray Examination: The x-ray films taken February 3, 1948 showed a

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FIGURE 1: Postero-anterior view, made from an x-ray film taken February 3, 1948. Large rounded density of left lower lung field contiguous with the heart shadow.

FIGURE 2: Left Lateral View, taken February 3, 1948. Mass located in anterior chest.

large rounded density about 10 cm. in diameter occupying the left lower lung field and contiguous with the heart shadow (Fig. 1). Normally aerated lung was seen above, laterally and below the mass. A lateral view (Fig. 2) demonstrated the mass to be in the anterior chest, in the region of the lingula. The remainder of the thorax appeared normal. Fluoroscopy in the chest clinic on February 3, 1948 confirmed the above findings, and revealed, in addition, that the mass was non-pulsatile and that both diaphragms functioned normally.

Diagnostic Aspiration: A diagnostic aspiration was decided upon and was performed on February 3, 1948. After local anesthesia with 2 per cent procaine, a 17 gauge needle was introduced through the left sixth interspace in the anterior axillary line. About 125 cc. of moderately thick brown opaque odorless fluid was removed, and replaced with an equal volume of air. Microscopic examination of the fluid showed many mesothelial cells. No tubercle bacilli or other organisms were seen on direct smear. Study of many smears of the fluid failed to reveal tumor cells. Cultures for pyogens were sterile. X-ray inspection following aspiration of fluid and replacement with air (Fig. 3) showed the previously described mass to be a thick-walled cyst, in the left anterior chest, the medial wall of which seemed continuous with the heart shadow (Fig. 4).

Laboratory Data: Urinalysis, blood urea and sugar, hemoglobin, red and white blood cell counts, and differential were normal. The blood Wassermann and Kahn tests were negative.

Hospital Course: The patient was admitted to Hahnemann Hospital on February 17, 1948 for exploratory left thoracotomy. Bronchoscopy showed no abnormalities. On February 28, 1948 a left thoracotomy was performed by Dr. Charles P. Bailey and associates. A tense ovoid cyst, about the size of a small grapefruit, was found attached to the pericardial surface of the mediastinum by a narrow pedicle. By blunt and sharp dissection the pedicle was sectioned and the cyst was delivered unruptured from the

FIGURE 3: Posterio-anterior view, taken February 3, 1948. Cyst wall outlined. Fluid level present.

thorax. The patient left the operating room in good condition. Her postoperative course in the hospital was uneventful, and she was discharged on March 5, 1948, to be followed in the Chest Clinic.

Pathology Report

The cyst was examined by Dr. John E. Gregory, pathologist, whose report follows: "Gross appearance. The specimen consists of a cyst-like mass measuring approximately 11 cm. in diameter (Fig. 5). The external surface is pinkish gray in color, and smooth. When the cyst is opened (Fig. 6) it is found to contain thin sanguinous fluid and brick red amorphous material. The cyst wall averages 2 mm. in thickness. Microscopic examination: The cyst wall is composed of a thick layer of hyalinized connective tissue with coagulated blood, and containing many cholesterol crystals on the inside. There is no epithelial lining (Fig. 7). The outer portion of the wall (Fig. 8) contains fat, scattered lymphoid nodules, and definite thymic tissue. This appears to be a thymic cyst. There is no evidence of malignant change. Diagnosis: Thymic cyst, benign."

Subsequent Course: Following discharge from the hospital, the patient's cough improved and there was no recurrence of dyspnea. Physical examination revealed slight decrease in the intensity of breath sounds in the lower left chest. X-ray inspection on June 18, 1948 (Fig. 9) showed a normal postthoracotomy chest.

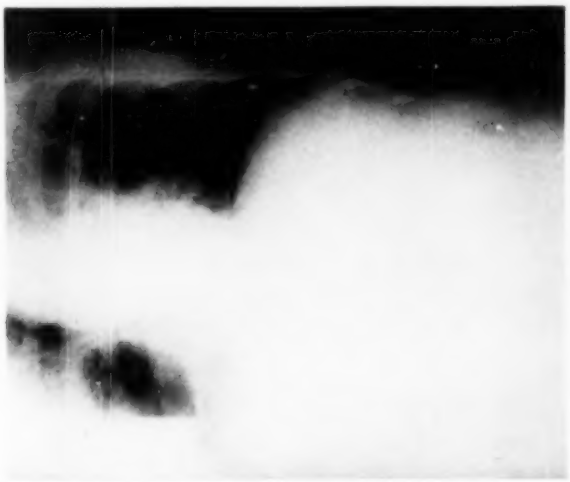

FIGURE 4: Posterio-anterior view, taken February 3, 1948. Cyst wall appears contiguous with heart shadow. Fluid level present.

FIGURE 5 FIGURE 6

Figure 5: External Appearance of the Cyst: The surface is smooth, except for fibrous attachments. It is almost round and measures about 11 cm. in greatest diameter.—*Figure 6:* Shows Wall, Lining and Contents: The cyst wall measures approximately 2 mm. in thickness, with some variation. The lining is covered with reddish-brown amorphous material and shows numerous areas of roughening. The contents are thin reddish fluid and much amorphous material which contains some cholesterol crystals. All of this appears to be derived from old blood.

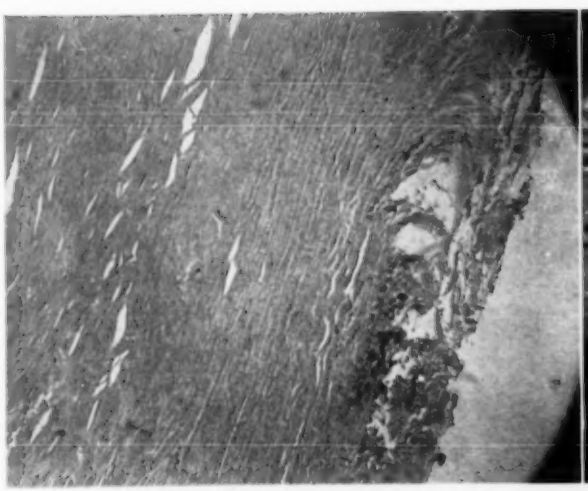

FIGURE 7

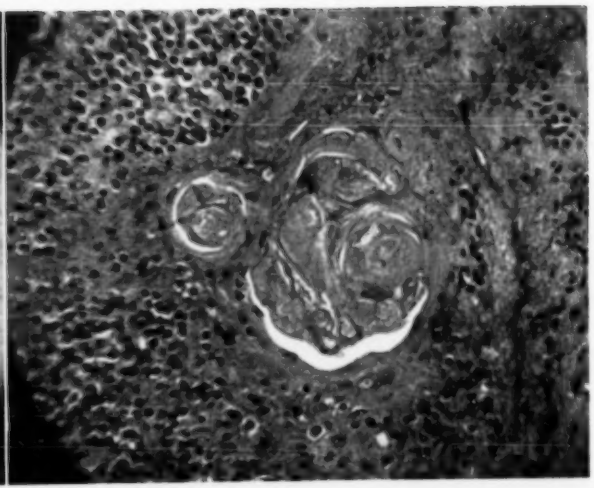

FIGURE 8

Figure 7: Microscopic view of the wall which is composed of dense hyalin connective tissue. No epithelial lining can be made out. On the inner surface is seen old blood and the slits characteristic of cholesterol deposits.—*Figure 8:* Microscopic view of wall: The outer portions contain fat, scattered lymphoid nodules and definite thymic tissue. There are two hyalinized Hassal corpuscles with scattered epithelial-like cells about them inside the zone of lymphocytes.

Discussion

While large non-neoplastic thymic cysts are rare, there have been many reports of small, single and multiple cysts. Speers[4] reviewed the literature to 1938, and other reports are listed by Ewing.[5] In these papers the most interesting, and at the same time the most confused, question is that of the origin of the cysts. Ribbert[6] regarded all of them as derived from persistent embryonal tubules. That persistence of embryonic remnants is an important etiologic factor is recognized by all the authors consulted. Marine,[7] writing in Cowdry's special Cytology, is apparently in agreement with Ribbert[6] for he writes that the cysts may be derived from two sources, "First, by the inclusion and persistence of remnants of the branchial cleft epithelium dragged downward with the thymus anlage Secondly, they may arise from the failure of the original thymic tubule to lose it's lumen or from further differentiation of the thymic cord into tubules " Ewing[5] added another possible origin in invasion and distention of Hassell's corpuscles by lymphocytes which subsequently degenerate. Smart[1] thinks that some pathologic process occurring in an otherwise normally formed organ can produce cysts. Speers[4] is of the opinion that such pathologic processes may be regressive changes in Hassell's corpuscles or focal necrosis of medullary tissue producing "sequestral cysts."

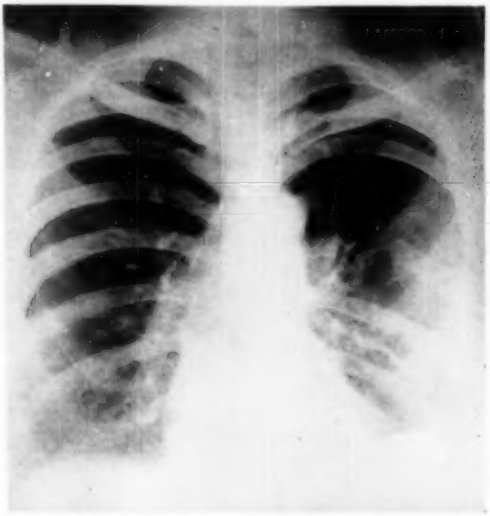

FIGURE 9: Postero-anterior view taken June 18, 1948 after thoracotomy.

The absence of a demonstrable epithelial lining in the present case makes it rather difficult to be confident as to the origin. That hemorrhage had occurred into the cyst, and, indeed, had probably contributed greatly to it's enlargement, is certain. Such increased pressure may have destroyed a previously existing lining. It would seem, therefore, that the cyst reported here is either a "sequestral cyst" as described by Speers,[4] or, more likely, an embryonic remnant into which there had been hemorrhage and subsequent fluid absorption.

SUMMARY

A case of benign thymic cyst, causing cough and dysnea in a middle-aged negress, and successfully removed surgically, is presented in detail.

RESUMEN

Se presenta en detalle un caso de quiste benigno del timo que causaba disnea y tos en una negra de edad media, habiéndose extirpado el quiste quirúrgicamente con éxito.

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Metastatic Malignant Tumors to the Bronchus Found in Bronchial Biopsy and Secretions*

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Metastases to the lung from primary malignant tumors elsewhere are exceedingly common. In this respect, they are probably only second to metastatic lesions of the liver. Willis[1] found pulmonary metastases in 31 per cent of 323 necropsies of malignant cases. These figures were exceeded only by those for the liver which contained metastases in 36 per cent of these cases. Turner and Jaffee,[2] in reviewing 1303 necropsies of neoplasms of all parts of the body, found that 26.6 per cent metastasized to the lung. It is not unreasonable to assume that some of the metastatic nodules may erode into bronchi, or indeed, metastasize directly to the bronchial mucosa. King and Castleman[3] analyzed 109 autopsies of malignant growths which metastasized to the lung. Although only routine sections were studied, they found that 20 (18.3 per cent) showed invasion of bronchial wall or mucosa. These cases included 14 carcinomas and six sarcomas. A study of the bronchial biopsy or aspirate from such metastatic bronchial lesions may lead to the erroneous diagnosis of bronchogenic carcinoma.

Weiss[4] in 1929 described two cases of carcinoma of the head of the pancreas which had metastasized to peribronchial lymph nodes and then had invaded the mucosa of the large bronchi. He called these secondary bronchial growths to the attention of the bronchoscopist and pathologist so that they might not be confused with primary bronchial tumors. Since then, several cases have been reported in which metastatic tumors in the lung have eroded bronchi and extended into the bronchial lumens.

Vinson and Martin[5] reported a case of hypernephroma with pulmonary metastasis in which the diagnosis was made on bronchoscopic examination. Clerf[6] described a metastatic pedunculated melanoma which was removed from the left main bronchus. In Maytum and Vinson's[7] case of hypernephroma, the pulmonary metastasis was diagnosed on bronchial biopsy. Barney and

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Churchill[8] reported a case of adenocarcinoma of the kidney with metastasis to the lung in which nephrectomy and later pneumonectomy were performed. The patient was living and well five years after the pneumonectomy. Bosse[9] described a case of teratoma of the testis in which metastatic pulmonary nodules encroached on the lumen of the right main bronchus. Raines[10] described a case of adenocarcinoma of the colon which had metastasized to the right lung; a biopsy of the right upper lobe bronchus showed the tumor. Freedlander and Greenfield[11] reported two cases of metastatic pulmonary tumors in which hemoptysis occurred and simulated bronchogenic carcinoma. In one case, the right lung was removed when a bronchial biopsy revealed a large malignant mass. This was later found to be identical histologically with a granulosa cell tumor of the ovary which was removed subsequently. Their second case was a papilliferous adenocarcinoma of the thyroid gland which had metastasized to the right lung and had invaded the bronchi of the middle and lower lobes. Betts[12] obtained metastatic tumor through the bronchoscope from a case of lymphosarcoma and one of malignant melanoma of the eyelid.

Tinney and McDonald[13] reported three cases of metastatic tumors which were diagnosed on bronchial biopsy. The first was a carcinoma of the thyroid, the second a carcinoma of the breast, and the third a hypernephroma. Dodge, Schmidt, and McDonald[14]

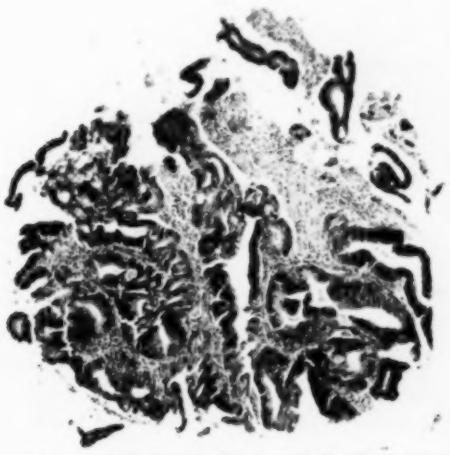

FIGURE 1. CASE 1: Entire biopsy removed from lumen of right lobe bronchus. Note striking resemblance to adenocarcinoma of the colon from which this is a metastasis.

had two cases of hypernephroma which had metastasized to the lung, eroded bronchi, and were diagnosed on bronchial biopsy. They failed to find the tumor cells in the bronchial washings and sputum.

We recently had two cases of metastatic pulmonary tumors which were diagnosed by bronchial biopsy and by bronchial secretions: (1) an adenocarcinoma of the sigmoid colon and (2) a malignant melanoma. A third case, that of a rhabdomyosarcoma of the right kidney was encountered at necropsy. This tumor which had metastasized to the lymph nodes of the bronchus of the lower lobe of the left lung, had grown through the bronchial walls of the branches of the bronchus and extended into the lumens as small polypoid masses.

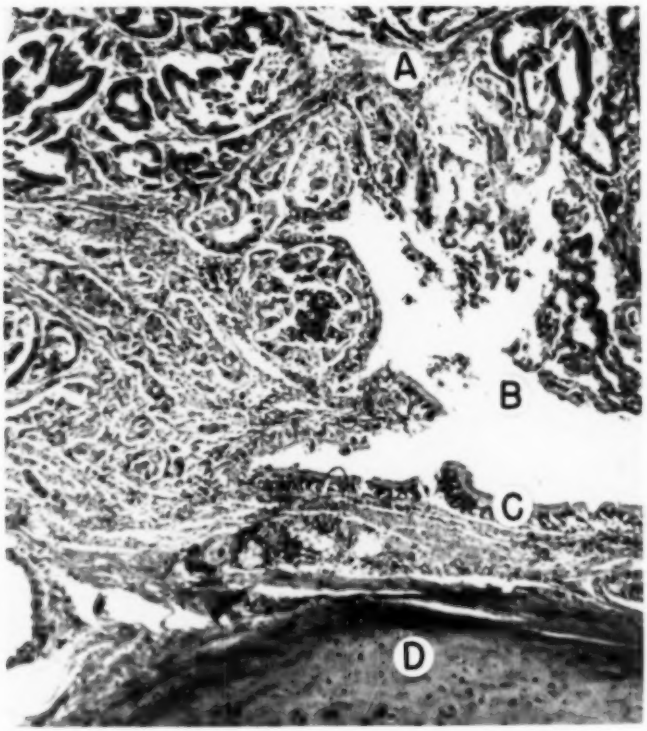

FIGURE 2, CASE 1: Metastatic adenocarcinoma eroding through bronchus: (A) Adenocarcinoma, (B) Lumen of Bronchus, (C) Respiratory Mucosa of Bronchus, (D) Cartilage. Note marked diminution in size of lumen due to intraluminal projection of the metastasis.

Report of Cases

Case 1: A 71 year old white male re-entered Birmingham Veterans Administration Hospital on March 1, 1949, with the chief complaint of coughing up small quantities of blood since December 1948. In July 1945, in another hospital, he had had a prostatectomy for prostatic carcinoma, followed several months later by bilateral orchidectomy. In December 1948, a colostomy was done in this hospital followed in 1948 by colectomy. The pathologic diagnosis was "adenocarcinoma of the sigmoid colon with extension to the serosa." Recovery was good and he was discharged in January 1948.

X-ray films of the chest in January 1949, and again in March 1949, showed a fibronodular density in the apex of the left lung. Bronchoscopy revealed a small friable mass occluding the lumen of the right lower lobe bronchus. A bronchial biopsy of this mass was diagnosed as an adenocarcinoma, probably of colon origin (Figure 1). The bronchial secretions were also positive for tumor cells. The patient died within a month following bronchoscopy.

Necropsy confirmed the finding of a metastatic adenocarcinomatous nodule in the central aspect of the middle and lower lobes of the right lung. The tumor had eroded through the bronchus of the right lower lobe and extended into the lumen (Figure 2).

The prostate showed no tumor, although there were areas of glandular hyperplasia. There was a well approximated and functioning recto-

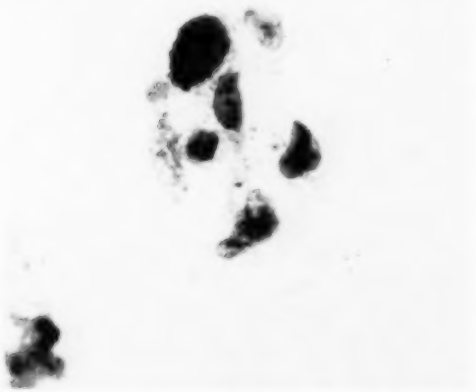

FIGURE 3, CASE 2: Bronchial aspiration in case of metastatic malignant melanoma. Note the large hyperchromatic malignant cells which vary in size and shape. The nuclei of these cells are large and the cytoplasm scant. One tumor cell is pigmented.

sigmoid anastomosis and anaplastic adenocarcinoma was found in the perivesical tissue.

Case 2: A 28 year old white male, entered Birmingham Veterans Administration Hospital in August 1949, complaining of nausea and vomiting for one week and pain in the back for three weeks. He was extremely weak and had a temperature of 100 degrees F. X-ray inspection of the chest revealed several masses varying from five to 25 mm. in diameter. Bronchial biopsy in September showed a small clump of malignant cells, not attached to the bronchus, and several clumps in the bronchial secretions (Figure 3). The clump of tumor cells, in no way attached to the bronchial specimen, was considered probably of metastatic origin. Subsequent history from his wife disclosed that he had had a small red nodule removed from his back two years previously. Examination of this area revealed a tiny, well healed scar with several surrounding small subcutaneous purple nodules. Frequent daily examinations of the skin soon disclosed crops of purplish-blue and nonpigmented nodules one of which was studied microscopically and proved to be a malignant melanoma. He expired in December, two months after admission to the hospital.

At necropsy, extensive melanotic and amelanotic tumor nodules were scattered widely in the skin and subcutaneous tissue, superficial and deep lymph nodes, and in the organs of the abdominal and thoracic cavities: liver, gallbladder, spleen, pancreas, adrenal glands, urinary bladder, gastro-intestinal tract, lungs, and heart. The lymph nodes surrounding the bronchus of the lower lobe of the right lung was completely replaced by a large, firm, amelanotic tumor mass which had eroded through the bronchial wall, projecting by a farily broad base as a polypoid mass in the lumen, almost completely occluding it. The lobe of the lung, distal to the occlusion, was the site of extensive suppurative pneumonitis and pus exuded from most of the bronchioles.

Of especial interest in this patient was the presence of metastatic calcification. Deposits of calcium were present in the stomach, kidneys, lungs, and heart. The entire left auricle was diffusely involved by extensive deposition of calcium within the subendocardium. One parathyroid gland appeared moderately hyperplastic. This case is to be the subject of a later report.

Case 3: A 46 year old white male was transferred to Birmingham Veterans Administration Hospital from another institution on October 14, 1949. He was extremely weak, had night sweats, had lost 30 pounds in weight in the past 10 months, had occasional severe coughing spells, and had dysuria and nocturia for the past year. On physical examination the liver was increased in size and a large mass, presumably kidney, was palpated in the right flank. The base of the left lung disclosed impaired breath sounds and decreased resonance.

Repeat urinalysis disclosed albumin 2 plus and 60 to 70 red blood cells per high power field. X-ray inspection of the chest showed round patches of densities in the bases of both lungs. A flat film of the abdomen showed that the right renal and psoas outlines were not well demonstrated. The patient expired 12 days after admission.

At necropsy the right kidney was almost entirely replaced by a huge solid greyish-yellow tumor mass, spotted with areas of necrosis and tiny hemorrhages. The lower lobe of the left lung was studded with tumor nodules and the lymph nodes surrounding the bronchus of the lower

lobe were replaced by a bulky tumor. The tumor had extended through the peribronchial lymph nodes and bronchial walls, projecting by fairly broad pedicles as small polypoid masses into the lumens at the bifurcation of the lower lobe bronchus (Figure 4). Microscopically, the tumor in the bronchus was a rhabdomyosarcoma identical with that of the kidney.

Comment

Tumors that metastasize to the lung or peribronchial lymph nodes may eventually enlarge and erode through a bronchus, or may metastasize directly to the bronchial mucosa. In either instance, the tumor may present into the lumen as a small polypoid mass; usually the mass has a fairly broad base. Clinically, emphysema or atelectasis of the distal lung parenchyma is produced, depending upon whether the lumen is partially or completely occluded. If infection is superadded, suppurative pneumonitis is also found in the distal lung parenchyma and pus exudes from bronchioles.

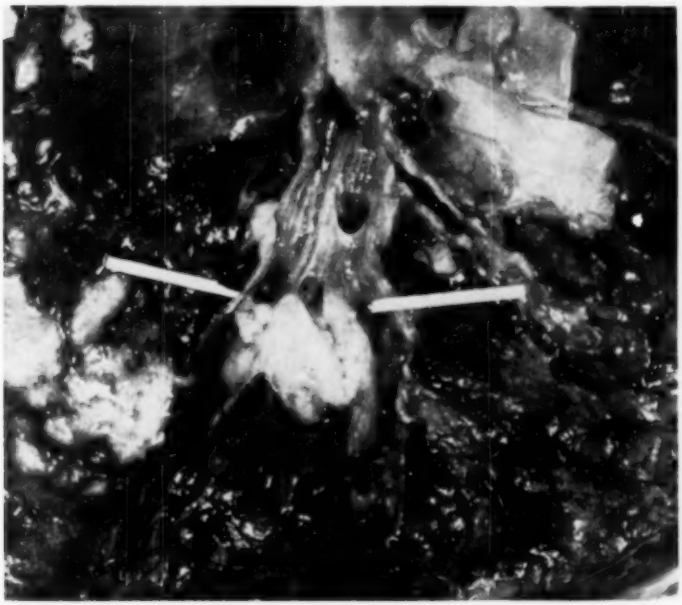

FIGURE 4. CASE 3: Polypoid tumor mass extending from peribronchial lymph nodes into main stem bronchus of left lower lobe. The tumor projects through the branches of the bronchus by broad pedicles. Note that the tumor does not encircle the bronchial walls, in contradistinction to cases of stenosing bronchogenic carcinoma. The tumor was a rhabdomyosarcoma, histologically identical with that found in the primary site, the right kidney.

To the bronchoscopist, a polypoid mass should indicate a metastatic pulmonary tumor or a bronchial adenoma, since bronchogenic carcinomas in the majority of instances tend to extend into the parenchyma, rather than into the lumen. Starting as small plaques in the bronchial mucosa, bronchogenic carcinomas extend into the connective tissue spaces of the bronchial wall and into the lung parenchyma. They frequently encircle the cartilaginous plates and the bronchial wall, causing marked stenosis and rigidity of the bronchus and erosions of the mucosa so that the normal glistening, pink mucous membrane is replaced by greyish-white tumor.[15]

Both primary and metastatic malignant bronchial tumors may exfoliate tumor cells into the lumens. Thus, tumor cells may be found in the sputum, as well as on direct smear of the affected bronchus or in adjacent bronchial secretions. Since it is not unusual to attach a diagnosis of primary lung tumor to positive bronchial biopsies and secretions, it is necessary to carefully evaluate such findings before radical surgery is contemplated.

CONCLUSIONS

1) Metastatic pulmonary tumors which erode bronchi and extend into lumens may be detected by bronchial biopsy and cytologic examination of secretions.

2) Two such cases are reported: first, an adenocarcinoma of the sigmoid colon which had metastasized to the lung as a solitary nodule, and had eroded through the bronchus of the lower lobe of the right lung; and second, a malignant melanoma which had metastasized as multiple nodules to both lungs. In both, malignant cells were detected in the bronchial biopsies and secretions. The second case is also of interest because it presented metastatic calcification.

3) A third case of intrabronchial polypoid tumor, metastatic from a rhabdomyosarcoma of the kidney, was encountered at necropsy.

4) To the bronchoscopist, a polypoid intrabronchial lesion should suggest a metastatic tumor or bronchial adenoma, since bronchogenic carcinomas in the majority of instances tend to grow into the lung parenchyma rather than into the lumen. Bronchogenic carcinomas encircle the bronchial wall and cause rigidity and stenosis of the bronchus, rather than project into bronchial lumens as polypoid masses.

5) Care must be taken in evaluating positive bronchial biopsies or aspirates in order to avoid designating metastatic lesions as primary bronchogenic neoplasms.

CONCLUSIONES

1) Los tumores pulmonares metastásicos que destruyen la pared bronquial y penetran en el lumen, pueden ser descubiertos por la broncoscopia con biopsia y el examen de las secreciones.

2) Se refieren dos casos de esos: Primero el de un adenocarcinoma del colon sigmoide que se metastasizó en el pulmón en forma de nódulo solitario y produjo erosión del bronquio del lóbulo inferior del pulmón derecho y el segundo caso un melanoma maligno que hizo metástasis en nódulos múltiples en ambos pulmones. En ambos las celdillas malignas se encontraron en las biopsias bronquiales y en las secreciones. El segundo caso es también de interés porque se presentó calcificación metastásica.

3) Un tercer caso de tumor polipiode intrabronquial metastásico a partir de un rabdomioma del riñón, se encontró a la autopsia.

4) Para el broncospista una lesión polipoides intrabronquial debe sugerir un tumor metastásico o un adenoma bronquial puesto que los carcinomas bronquqiqgénicos en la mayoría de los casos tienden a cercer dentro del perenquima pulmonar más bien que hacia el lumen.

Los carcinomas bronquigénicos rodean la luz bronquial y causan rigidez y estenosis del bronquio más bien que proyectarse hacia la luz bronquial en masas polipoides.

5) Debe tenerse cuidado al estimar las biopsias positivas o exámenes de secreciones a fin de calificar como carcinomas bronquiogénicos a las metástasis.

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Autopsy Incidence of Pulmonary Embolism in Tuberculosis

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Reports of the autopsy incidence of pulmonary embolism in non-surgical general hospital patients[1] especially those with coronary heart disease[2,3] have resulted in increasing use of anticoagulant therapy in "medical" patients. The autopsy incidence of pulmonary embolism in patients dying with active tuberculosis has not been stressed in comparable fashion.

In a previous report[4] I have discussed the necropsy incidence of active tuberculosis in a series of 634 consecutive autopsies performed over a five year period in an institution where both mental patients and general hospital patients were cared for, and where the average age at autopsy was unusually high (60 years). This same series of autopsies has also been used as a basis for reports on the incidence of pulmonary embolism due to prostatic thrombosis[5] and the incidence of pulmonary embolism in coronary heart disease.[6] The high incidence of pulmonary embolism and the frequent finding of active tuberculosis in the series suggested that this group of autopsies might well be analyzed from the viewpoint of the incidence of pulmonary embolism in subjects with active tuberculosis. Such an analysis should be helpful in evaluating the importance of prevention of pulmonary embolism in tuberculous patients and the possibility of the use of anticoagulant therapy in cases of tuberculosis complicated by thrombo-embolic phenomena or in certain selected cases where the possibility of thrombo-embolic complications seemed likely.

In the series of 634 consecutive autopsies, active tuberculosis was found in 111 subjects, an incidence of 17.5 per cent. These 111 cases form the basis of the present report, although it is recognized that this number is small from a statistical standpoint. Pulmonary embolism was found 27 times in these 111 autopsies (24.3 per cent). This incidence is slightly higher than the incidence of pulmonary embolism in the entire series (23.1 per cent). Four of these emboli were classed as massive (occluding one half or more of the pulmonary circulation) and 23 were classed as minor.

The four massive emboli were regarded as the immediate cause

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of death, and in three of these four cases the tuberculous lesions were of such nature that the patient might have recovered if the embolism had not occurred. The exact relationship between the minor emboli and the patients' deaths cannot be determined but lung infarcts occurred in two cases in this group and there seems no doubt that these minor emboli played at least a contributory role in some instances.

Due to the fact that the average age in the 111 cases of active tuberculosis was high (55 years), the possibility of coexisting heart disease as an etiologic factor in the production of the emboli was considered. Slight to moderate arteriosclerotic narrowing of the coronary arteries with no evidence of congestive heart failure was found in one of the four subjects with massive emboli. Of the 23 subjects with minor emboli, seven showed slight arteriosclerotic narrowing without congestive failure, two showed arteriosclerotic heart disease with congestive heart failure, and one subject died of coronary thrombosis while under treatment for tuberculosis. These figures would indicate that the tuberculous lesions requiring bed rest rather than associated heart lesions were responsible for the emboli in this group.

It should be mentioned that one massive and two minor emboli occurred in patients where the tuberculosis was active in areas other than the lungs. All of the rest of the emboli and all of the infarcts occurred in patients with active pulmonary tuberculosis. All of the patients were at bed rest.

SUMMARY

Pulmonary embolism was found 27 times in 111 consecutive autopsies in subjects with active tuberculosis (24.3 per cent). This compares with an incidence of pulmonary embolism of 23.1 per cent in a series of 634 autopsies in which the 111 cases of tuberculosis were found. Four of the emboli were classified as massive and 23 were regarded as minor. Lung infarction occurred four times.

This high incidence of pulmonary embolism in patients dying with active tuberculosis suggests that proper prophylactic measures to reduce the incidence of pulmonary embolism and the use of anticoagulant therapy such as dicumarol or heparin may play a definite role in the treatment of tuberculosis. Careful laboratory control of the prothrombin and coagulation times would be required in the use of dicumarol or heparin because of the possibility of pulmonary hemorrhage.

RESUMEN

En 111 autopsias realizadas en enfermos de tuberculosis pulmonar activa, embolia pulmonar estubo presente en 27 cases (24.3 por

ciento). Estos 111 casos de tuberculosis fueron hallados en una serie de 634 autopsias; obteniendo 23.1 por ciento de embolias pulmonares en el total.

Cuatro de las embolias eran masivas y 23 fueron menores. Infarto del pulmón ocurrió cuatro veces.

Este porcentaje alto de embolia pulmonar, en enfermos que mueren de tuberculosis pulmonar activa, sugiere el uso profiláctico de anticuagulantes como ser decumerol o heparina; los cuales, posiblemente, desempenen un papel importante, en el tratamiento de la tuberculosis. Deben hacerse prolijos estudios del tiempo de coagulación y protrombina, en los casos en que se use decumerol y heparina, debido a la posibilidad de hemorragia pulmonar.

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4 Moran, Thomas J.: "Necropsy Incidence of Tuberculosis in a Hospital for the Mentally Ill," *Dis. of Chest*, 14:132, 1948.

5 Moran, Thomas J.: "Pulmonary Embolism in Nonsurgical Patients with Prostatic Thrombosis," *Am. J. Clin. Path.*, 17:205, 1947.

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First International Congress on Diseases of the Chest

ROME, ITALY - SEPTEMBER 17-22, 1950

Sunday, September 17

10:30 a.m. Inaugural Ceremonies (Campiodoglio, The Hall of Orazi and Curiazi)

Greetings:

His Honor, the Mayor of Rome.
Prof. A. Omodei Zorini, Medical Director, Forlanini Institute.
Prof. Eugenio Morelli, University of Rome Medical School.
Co-Chairmen of the Congress.

Prof. Giovanni L'Eltore, Italian Federation Against Tuberculosis.
The High Commissioner of Hygiene and Health.
The Director of the National Institute of Social Providence.

Response:

Louis Mark, Columbus, Ohio, U.S.A., President,
American College of Chest Physicians.

Awarding of the College Medal:

Jay Arthur Myers, Minneapolis, Minnesota, U.S.A.
Chairman, Committee on Award.

Introduction of Members of the Embassies, the Italian Government and other dignitaries.

Monday, September 18

9:00 Conducted Tour of the Carlo Forlanini Institute

SCIENTIFIC PROGRAM

10:30 Morning Session

HALL No. 1

Andrew L. Banyai, *General Chairman, Scientific Assembly*

A. Omodei Zorini, *Chairman of Session*

James H. Stygall, *Co-Chairman*

"Apico-Axillary and Basal Extrapleural Pneumothorax"
Eugenio Morelli, Rome, Italy
Discussor: Gumersindo Sayago, Cordoba, Argentina

HALL No. 2

William A. Hudson, *General Chairman, Scientific Assembly*

Maurizio Ascoli, *Chairman of Session*

Peter Edwards, *Co-Chairman*

"Tumors of the Mediastinum"
R. Paolucci, Rome, Italy
Discussor: Juan Macchiavello, Lima, Peru

HALL No. 1

"Primary Atypical Pneumonitis"
C. Giunchi and B. Mariani, Rome, Italy
Discussor: H. O. Hofmeyr, Cape Town, South Africa

"Anatomico-Clinical Forms of Bronchogenic Carcinoma"
M. Bariety and J. Paillas, Paris, France
Discussor: Pedro M. Iturbe, Maracaibo, Venezuela

"Physio-Pathology of the Middle Lobe"
A. Soulas and J. M. Lemoine, Paris, and P. Mounier-Kuhn, Lyon, France

"Benefits of Excision in Lung Disease"
Richard H. Overholt, Brookline, Massachusetts, U.S.A.

HALL No. 2

"Catheterization of the Right Cavities of the Heart; Cardio-Respiratory Function in Experimental Animals"
Victor Gimenez, Angel Larralde and J. Delgado Blanco, Caracas, Venezuela

"Obscure Pulmonary Bleeding"
J. J. Hennessey, Hartford, Connecticut, U.S.A.
Discussor: Aimi J. E. Thomas, Liege, Belgium

"Emphysematous Bullae and Pneumatoceles; Anatomico-Clinical Differentiation"
P. M. Galy, Lyon, France

"Heart Surgery"
A. Rodriguez Diaz, Havana, Cuba
Discussor: P. Valdoni, Rome, Italy

16:30 Afternoon Session, Monday, September 18

Eugenio Morelli, *Chairman*
Jay Arthur Myers, *Co-Chairman*

"The Pulmonary Circulation Under Different Pathological Conditions"
Lopo de Carvalho, Lisbon, Portugal

"Clinical Application of Artificial Pneumoperitoneum"
Andrew L. Banyai, Milwaukee, Wisconsin, U.S.A.
Discussor: G. Luzzato Fegiz, Rome, Italy

"Monilia Infections of the Respiratory Tract"
N. G. M. Orie, Groningen, Holland

"Chemotherapeutic Tamponade of Lung Cavities"
Gustav Maurer, Davos, Switzerland
Discussor: Ihsan Rifat Sabar, Istanbul, Turkey

Edgar Mayer, *Chairman*
Raman Viswanathan, *Co-Chairman*

"Extrapleural Pneumothorax: Indications and Results Based on the Analysis of 1,500 Cases"
Marcel B. Santy, Lyon, France
Discussor: Ismael Cosio Villegas, Mexico City, Mexico

"Changing Concepts for Indications for Collapse Therapy in Pulmonary Tuberculosis"
Benjamin P. Potter, Jersey City, New Jersey, U.S.A.
Discussor: Eugenio Morelli, Rome, Italy

"Microbiologic Study of Paratubercle Bacilli"
G. Penso, C. Cattaneo and M. Morellini, Rome, Italy

"New Tomographic Apparatus"
T. Wedekind, Hallersen-Luedencheid, Germany

HALL No. 1

"Further Studies on PAS in the Treatment of Pulmonary Tuberculosis"
Henry C. Sweany,
Chicago, Illinois, U.S.A.
Discussor: C. Pana, Rome, Italy

HALL No. 2

"One Hundred Cases of Pulmonary Tuberculosis Treated with Pneumoperitoneum"
Herman Gauthier,
Mont Joli, Quebec, Canada
Discussor: W. Paton Philip,
Cambridge, England

"Treatment of Intestinal Tuberculosis with Antibiotics and Chemotherapy"
F. Piechaud and P. Freour,
Bordeaux, France
Discussor: V. Fici, Palermo, Italy

Tuesday, September 19

9:00 *Morning Session*

Sir Harold Boldero, *Chairman*
Vincente Monaldi, *Co-Chairman*

"Adenoma of the Bronchus"
Chevalier L. Jackson,
Philadelphia, Pennsylvania, U.S.A.

"Bronchiectatic Bronchiolitis"
A. Omodei Zorini and G. Bottari,
Rome, Italy
Discussor: Manuel Quisumbing,
San Pablo, Philippine Is.

"Rehabilitation of the Coronary Cripple"
Samuel A. Thompson,
New York, New York, U.S.A.
Discussor: C. Craaford,
Stockholm, Sweden

"Pulmonary Fibrosis"
Edgar Mayer,
New York, New York, U.S.A.
Discussor: Paul Veran,
Nantes, France

"Neurogenic Tumors of the Mediastinum"
Cesar Rodriguez, Victor Brito and Leandro Potenza,
Caracas, Venezuela
Discussor: Theodore Schrire,
Cape Town, South Africa

N. B. Oekonomopoulos, *Chairman*
David P. Marais, *Co-Chairman*

"Angioneumography in Pulmonary Physio-Pathology"
R. Rimini, R. Burgos, J. Duomarco, A. Rodriguez, J. P. Sapriza and G. H. Surraco,
Montevideo, Uruguay

"The Status of Extrapleural Pneumothorax"
H. Martinez de Alva,
Tijuana, Mexico
Discussor: Kyriakos Katrakis,
Athens, Greece

"Domiciliary Treatment in the Battle Against Tuberculosis in Crowded Cities"
J. Wallace Craig, London, England
Discussor: James E. Edlin,
New York, N. Y., U.S.A.

"Silent Tumors of the Chest"
F. Rose, Eschwege-Werra, Germany
Discussor: K. N. Kivikanervo,
Helsinki, Finland

"Tumors of the Esophagus"
William A. Hudson,
Detroit, Michigan, U.S.A.

HALL No. 1

"Cytologic Diagnosis of Lung Cancer"
Seymour M. Farber,
San Francisco, California, U.S.A.

"Evaluation of Conservative and Radical Surgical Procedures in Pulmonary Tuberculosis"
Donato G. Alarcon,
Mexico City, Mexico
Discussor: Cabot Brown,
San Francisco, California, U.S.A.

"Bronchial Lavage in Diagnosis"
Manoel de Abreu,
Rio de Janeiro, Brazil
Discussor: Juan J. Castillo,
Havana, Cuba

HALL No. 2

"Phthisiogenesis and the Tuberculin Reaction"
Gennero Costantini, Bologna, Italy

"Carcinoma of the Lung and Chromates"
Stelio Imprescia,
Perry Point, Maryland, U.S.A.

"The Use of Chemotherapeutic Drugs in the Treatment of Tuberculosis with Collapse Therapy"
D. N. Kesarbani, Bhowali, India

"Industrial Pulmonary Dust Diseases and Control of Hazards"
Frank R. Ferlaino,
New York, New York, U.S.A.
Discussor: Carlos Maldonado,
Puerto-Montt, Chile

"Endoscopic Approach to the Autonomic Nervous System and Its Therapeutic Possibilities (Especially in Duodenal Ulcer, Hypertension, Angina Pectoris and Diabetes Mellitus)"
E. F. Kux, Innsbruck, Austria

16:30 Afternoon Session, Tuesday, September 19

Etienne Bernard, *Chairman*
Luis Saye, *Co-Chairman*

"Primary Tuberculosis in Adults"
Jay Arthur Myers,
Minneapolis, Minnesota, U.S.A.
Discussor: Prof. Laumonier,
Bordeaux, France

"Antibiotic Therapy and Artificial Pneumothorax"
R. Umberto Carpi, Milan, Italy
Discussor: David P. Marais,
Cape Town, South Africa

"Tuberculosis as a General Infection"
N. B. Oekonomopoulos,
Athens, Greece

J. Winthrop Peabody, *Chairman*
Giovanni L'Eltore, *Co-Chairman*

"Constitutional Factors in the Pathogenesis of Tuberculosis"
Vincenso Fici, Palermo, Italy

"Streptomycin Therapy in Tuberculosis: Prevention of Streptomycin Resistance by Adequate Collapse Therapy"
Albert J. J. Reginster, Liege, Belgium
Discussor: Juan Escudero Villar,
Lima, Peru

"Decortication and Lung Resection in Pulmonary Tuberculosis"
Papken S. Mugrditchian,
Beirut, Lebanon
Discussor: Luis Gomez Lopez,
Barquisimeto, Venezuela

HALL No. 1

"Experience with TB-1 in the Treatment of Tuberculosis"
Alvaro Urgoiti, La Coruna, Spain
Discussor: B. Besta, Rome, Italy

"Physiotherapy in Nonsurgical Pulmonary Disease"
Alan H. Penington, Melbourne, Australia

"Observations on Extrapleural Pneumothorax: Report on 1,100 Cases"
O. Monod, Paris, France

HALL No. 2

"Surgical Management of Cavitary Tuberculosis"
G. Babolini, Naples, Italy
Discussor: Marcio Bueno, Fall River, Mass., U.S.A.

"Vaccination with BCG in the Mexican Republic"
Miguel Jimenez, Mexico City, Mexico
Discussor: V. P. Hinault, Paris, France

"Chemotherapy of Sarcoidosis"
Jaroslav Jedlicka, Prague, Czechoslovakia

Wednesday, September 20

9:00 Morning Session

Louis Mark, *Chairman*
Richard R. Trail, *Co-Chairman*

"Nontuberculous Spontaneous Pneumothorax and Its Treatment"
Etienne Bernard and Andre Meyer, Paris, France
Discussor: Ovidio Garcia Rosell, Lima, Peru

"Bronchotomy for Bronchial Adenoma"
Alfred Goldman, Beverly Hills, California, U.S.A.
Discussor: Carlos Stajano, Montevideo, Uruguay

"Incidence of Chest Diseases in Various Countries"
Giovanni L'Eltore, Rome, Italy
Discussor: J. B. McDougall, Geneva, Switzerland

"Bronchiectasis in Childhood and Adult Pulmonary Tuberculosis"
Antonio Navarrete and Teodosio Valledor, Havana, Cuba

William C. Voorsanger, *Chairman*
Miguel Canizares, *Co-Chairman*

"Open and Closed Extrapleural Technique"
Andre Marmet, Colmar, France

"The Protective Power of BCG in Allergics"
Jose Silveira, Salvador, Brazil
Discussor: George Georgocopoulos, Athens, Greece

"The Effect of PAS in Tuberculosis from Clinical, Anatomico-Pathological and Experimental Viewpoints"
G. Daddi, C. Pana, Giusto Fegiz and C. Cattaneo, Rome, Italy
Discussor: A. Omodei Zorini, Rome, Italy

"Pulmonary Mimicry of Bronchogenic Carcinoma"
John F. Briggs, St. Paul, Minnesota, U.S.A.
Discussor: Lord Moran, Manton, London, England

HALL No. 1

"Histologic Development of Early Tuberculosis and Its Alteration by Streptomycin"
Jaques Delarue, Paris, France
Discussor: Maurice Kovnat, Miami Beach, Florida, U.S.A.

"Segmental Resection in the Treatment of Pulmonary Tuberculosis"
J. Maxwell Chamberlain, New York, New York, U.S.A.
Discussor: H. Wamsteker, Haarlem, Netherlands

"Pneumoperitoneum Versus Pneumothorax"
James S. Edlin and Sydney Bassin, New York, New York, U.S.A.
Discussor: K. N. De, Calcutta, India

"Contribution to the Problem of International Classification of Tuberculosis"
Basil Papanikolaou, Athens, Greece
Discussor: Giovanni L'Eltore, Rome, Italy

HALL No. 2

"General Principles and Results of Treatment of Pulmonary Suppurations"
R. Kourilsky, M. Mathey, Regaud and P. Daumet, Paris, France
Discussor: R. Paolucci, Rome, Italy

Title to be announced
Robert T. Neubauer, Belgrade, Yugoslavia

"A Tuberculosis Unit as Part of a General Hospital"
Alfred A. Richman, New York, New York, U.S.A.

"Bronchial Tumors"
Pasquale Scrocca, Naples, Italy

"Functional Studies on the Mediastinum"
L. Condorelli, Rome, Italy

"New Diagnostic Features and Indications for Operation in Chronic Constrictive Pericarditis"
C. L. C. van Nieuwenhuizen, Utrecht, Netherlands

"Chronic Constrictive Pericarditis: Improvement in Surgical Technique and Results"
M. C. A. Klinkenbergh, Utrecht, Netherlands
Discussor: Bomy R. Billimoria, Bombay, India

16:30 Afternoon Session, Wednesday, September 20

Lopo de Carvalho, *Chairman*
Chevalier L. Jackson, *Co-Chairman*

"Simultaneous Bilateral Artificial Pneumothorax"
Maurizio Ascoli, Palermo, Italy
Discussor: Gustavo Aldereguia, Havana, Cuba

"Biological Dynamics of Tuberculosis"
Vincente Monaldi, Naples, Italy
Discussor: Leopoldo Molinari, Lima, Peru

Donato G. Alarcon, *Chairman*
Paul Veran, *Co-Chairman*

"Contributions to the Clinical Study of Cystic Disease of the Lung"
Raul Soules-Baldo, Caracas, Venezuela

"Laryngo-Tracheo-Bronchial Anesthesia with Subposological Doses of Pontocaine in Bronchoscopy and Bronchography"
A. Albert Carabelli, Trenton, New Jersey, U.S.A.

HALL No. 1

"Coccidioidomycosis"
Harold G. Trimble,
Oakland, California, U.S.A.
Discussor: J. Winthrop Peabody,
Washington, D. C., U.S.A.

"Echinococcus Cysts of the Chest"
Pietro Valdoni, Rome, Italy
Discussor: Mario Chapo Bortagaray,
Resistencia, Argentina

"Medical Treatment of Lung Abscess"
Tevfik Saglam, Istanbul, Turkey
Discussor: Lee Ogden,
New York, N. Y., U.S.A.

HALL No. 2

"Schistosomiasis of the Lung and Heart"
Halim A. Zaky, Alexandria, Egypt

"Antibiotics in the Treatment of Pulmonary Tuberculosis"
Carlos Arboleda Diaz, Jose Pablo Leyva and Rafael J. Mejia,
Bogota, Colombia

"Functional Problems in the Treatment of Tuberculosis and Silicosis"
Wilhelm Bolt and Otto Zorn,
Cologne, Germany

"Collapse Therapy in Patients at Home"
R. Heller, Hounslow,
Middlesex, England

"Surgical Treatment of Pulmonary Tuberculosis"
P. Abruzzini and M. Gemmi,
Naples, Italy
Discussor: Erik Hedvall,
Uppsala, Sweden

Thursday, September 21

9:00 *Morning Session*

Gustav Maurer, *Chairman*
Manuel Albertal, *Co-Chairman*

"An Interpretation of Tracheobronchial Tuberculosis"
Luis Saye, Buenos Aires, Argentina
Discussor: Tage Kjaer,
Copenhagen, Denmark

"Community-Wide Case-Findings by Chest X-Ray Examination"
Robert J. Anderson,
Washington, D. C., U.S.A.
Discussor: H. W. Wunderley,
Canberra, Australia

"The Clinical Use of PAS"
Jorgen Erik Lehmann,
Gothenburg, Sweden

"Pneumonectomy and Total Pleurectomy for Uncontrolled Pulmonary Tuberculosis and Empyema"
Juda M. Pauzner,
Petach Tikva, Israel

Manoel de Abreu, *Chairman*
Juan R. Herradora, *Co-Chairman*

"Use and Value of Angiopneumography"
P. Bourgois and Vic-Dupont,
Paris, France

"Aspergillosis of the Lung"
Panyotis Chortis, Athens, Greece

"Medico-Legal Aspects of Silicosis"
M. R. Even, Paris, France
Discussor: Peter W. Edwards,
Market Drayton,
Shropshire, England

HALL No. 1

"Tropical Eosinophilosis"
Raman Viswanathan,
New Delhi, India

"Pulmonary Manifestations of Schistosomiasis"
Abdel Aziz Sami, Cairo, Egypt

"Observations on Paragonomiasis at the Quezon Institute"
Miguel Canizares and Jose Celis,
Quezon City, Philippine Islands

"Bronchoscopic Findings in Specific Hilar Adenopathy"
Arslan, Scarpa and Grosser,
Padova, Italy

"Simple Method of Block Inflation Anesthesia for Lung Surgery"
Salomon Albert, Beirut, Lebanon

"Physiologic Factors in the Management of Chronic Pulmonary Diseases"
Burgess Gordon,
Philadelphia, Pennsylvania, U.S.A.
Discussor: Francisco R. D'Ovidio,
La Plata, Argentina

"Prone Position in Thoracic Surgery with Special Reference to Physiological Aspects"
Emil A. Naclerio,
New York, New York, U.S.A.

HALL No. 2

"Pathogenesis of the So-Called Idiopathic Spontaneous Pneumothorax and Related Conditions"
Anton Sattler, Vienna, Austria

"Small Thoracoplasties"
Alexander Tuxen, Asker, Norway
Discussor: Joaquim S. Cavalcanti,
Recife, Brazil

"Streptomycin in the Treatment of Tuberculosis"
Manuel Albertal,
Buenos Aires, Argentina
Discussor: Maurice Gilbert,
Geneva, Switzerland

"Treatment of Tuberculous Meningitis and Miliary Tuberculosis with Emphasis on Prolonged Streptomycin Therapy"
Moses J. Stone,
Boston, Massachusetts, U.S.A.
Discussor: Henri Durieu,
Brussels, Belgium

"Hydatid Cysts of the Lung"
Jorge A. Taiana,
Buenos Aires, Argentina

"Tuberculous Reinfection of the Bronchus in Adults"
Juan J. Castillo, Havana, Cuba

"Cardio-Respiratory Function Tests in Chest Surgery"
G. Di Maria, Rome, Italy

16:30 Thursday, September 21, Clinical-Pathological Conference

"Modification of Early and Late Lesions in Pulmonary Tuberculosis by Streptomycin"
C. Pana, et al, Rome, Italy

"Studies on Bronchial Pathology"
M. Montanini, Rome, Italy

"Research Studies on Pulmonary Physiology"
C. Canova, Rome, Italy

"Galleria Mellonella for Antibiotic Test in Tuberculosis"
C. Cattaneo and M. Morellini, Rome, Italy

"Intracavitary Application of Streptomycin and Its Use in the Surgical Treatment of Pulmonary Tuberculosis"
A. Omodei Zorini and G. Bottari, Rome, Italy

"The Omodei Zorini and Scoz Test"
A. L. Maccagno, Rome, Italy

"Diffuse Alveolar Pneumolithiasis; Case Presentation"
B. Mariani and N. Montanini, Rome, Italy

"Extrapleural Pneumothorax and Thoracoplasty: Indications"
A. Omodei Zorini, Rome, Italy

"Streptomycin Inhibitors"
C. Cattaneo and M. Morellini, Rome, Italy

"Streptomycin Resistance and Streptomycin Susceptibility"
G. Daddi, Rome, Italy

Title to be announced
A. Scarpa, Padova, Italy

Surgical Section

Demonstration of Apico-Axillary and Basal Extrapleural Pneumothorax
N. Di Paola and G. Zorzoli, Rome, Italy

Practical Demonstration of Endocavitary Aspiration and Endocavitary Streptomycin Therapy
G. Bottari, Rome, Italy

A program of motion picture films concerning various aspects of diseases of the chest will be shown each day of the Congress so that all interested physicians may have an opportunity to attend. The same films will be shown each day.
The following is a tentative program:

"Chemotherapeutic Tamponade of Lung Cavities"
Gustav Maurer, Davos, Switzerland

"Physiopathology of the Middle Lobe"
A. Soulas, Paris, France

"Bronchial Lavage"
Juan J. Castillo, Havana, Cuba

"A Bronchoscopic Clinic"
Paul H. Holinger, Chicago, Illinois, U.S.A.

"Streptomycin Drugs in the Treatment of Tuberculosis"
Medical Direction by H. Corwin Hinshaw, San Francisco, California.
Produced by E. R. Squibb & Sons, U.S.A.

"Supra-Aortic Esophagogastrostomy for Carcinoma of the Esophagus"
Philip Thorek, Chicago, Illinois, U.S.A.

"Applied Anatomy of the Bronchi and Lungs"
Chevalier L. Jackson, Philadelphia, Pennsylvania, U.S.A.

"Transthoracic Repair of Esophageal Hiatus Hernia Using Fascia Lata"
J. Norman O'Neill, Los Angeles, California, U.S.A.

"Surgical Resection of Thymic Tumors for Myasthenia Gravis"
Alfred Goldman, Beverly Hills, California, U.S.A.

"Lipiodol in the Diagnosis and Treatment of Bronchopulmonary Disease"
James S. Edlin, New York, New York, U.S.A.

Thursday Evening, September 21

Formal Dinner and Grand Ball

Awarding of Certificates to Officials of the College and to Fellows of the College.

Friday, September 22

Audience with His Holiness, the Pope
Tour of Rome
Entertainment

The Ladies Committee on Entertainment is arranging a program of receptions and visits to various interesting places to entertain the doctors' wives.

Special Meetings

The Regents and Governors of the College will meet in executive session with the Council on International Affairs on Saturday, September 16 and Friday, September 22. The time and place of the meetings will be announced at a later date.

Sixteenth Annual Meeting
American College of Chest Physicians

The Sixteenth Annual Meeting of the College held in San Francisco, June 21-25, was a huge success. The total registration at the College meeting was 505, an increase of 25 per cent over the registration obtained at the 1946 meeting of the College held in San Francisco. The largest attendance at a College meeting was last year in Atlantic City when the registration reached 913. The local committees, under the general chairmanship of Dr. William C. Voorsanger, conducted the various functions efficiently. The ladies reception committee is to be congratulated upon the excellent program arranged for the visiting doctors' wives. The visiting ladies expressed their sincere appreciation for the gracious hospitality extended to them by the ladies reception committee.

The scientific sessions of the College meeting were up to their usual high standards and were well attended. There were 26 papers on the program covering many aspects of diseases of the chest. Several papers were presented at a special session sponsored by the Council on International Affairs of the College. There were 17 round table luncheon meetings, 6 of which were presented on each day of the scientific sessions.

The round table luncheon on "The Evaluation of the Cardiac Status of Patients" by Dr. Italo F. Volini, was cancelled out of respect to Dr. Volini, who died suddenly of a heart attack at San Francisco on Saturday morning, June 24th. As usual, all of the round table luncheons were oversubscribed. It is regretted that many of the College members who wished to attend these luncheons were unable to be accommodated. It is suggested that members desiring to attend round table luncheon meetings make their reservations well in advance of the annual meeting.

An excellent x-ray conference was presented this year; its success is due to the kind cooperation of Dr. Lowell S. Goin, who served as the moderator, when Dr. Leo G. Rigler was obliged to leave suddenly for Japan.

The motion picture session on diseases of the chest presented on Friday evening contained an unusually interesting array of films which attracted a large audience. The popularity of the motion picture sessions held during the past two College meetings has established this function as a permanent feature for future meetings.

On Thursday, June 22, the Annual Conference of College Chapter Officials was held. On this occasion, past-presidents of College chapters were presented with certificates of merit by the President of the College for their loyalty to and support of the organization. This activity will be continued at future conferences of College chapter officials. Dr. Andrew L. Banyai, Milwaukee, Wisconsin, was elected chairman of the conference and Dr. George R. Hodell, Houston, Texas, was elected secretary.

Thursday, June 22, was devoted to administrative sessions and examinations for Fellowship in the College. The Executive Council, Board of Regents, Board of Governors, and all councils and committees held their annual meetings and planned their programs for the coming year.

Thirty-three candidates for Fellowship in the College took their oral and written examinations at the annual meeting in San Francisco. At the Convocation ceremony held on Saturday, June 24, 44 new Fellows were awarded their Fellowship Certificates. Following the presentation of the certificates, Mr. Paul C. Smith, Editor and General Manager of the San Francisco Chronicle, gave an interesting talk.

The highlight of the meeting was the annual presidents' banquet held on Saturday evening. Dr. Louis Mark, Columbus, Ohio, the incoming President, and Dr. Chevalier L. Jackson, Philadelphia, Pennsylvania, the President-Elect, as well as the officers of the College and guests from other countries were introduced. The presentation of the College Gold Medal Award to Professor Manoel de Abreu, of Rio de Janeiro, Brazil, was made by Dr. Jay Arthur Myers, chairman of the committee on awards, and the College Essay Award was announced by Dr. Eli H. Rubin, chairman of the essay committee. The essay award was won by Dr. Henry Zimmerman of Cleveland, Ohio. The banquet closed with an address by Dr. Joseph C. Placak, Cleveland, Ohio, the retiring President of the College.

THE FOLLOWING OFFICERS WERE ELECTED FOR THE YEAR 1950-1951:

President: Louis Mark, Columbus, Ohio
President Elect: Chevalier L. Jackson, Philadelphia, Pennsylvania
First Vice-President: Andrew L. Banyai, Milwaukee, Wisconsin
Second Vice-President: Alvis E. Greer, Houston, Texas
Treasurer: Minas Joannides, Chicago, Illinois
Assistant Treasurer: Benjamin L. Brock, Downey, Illinois

ANNOUNCEMENT

Postgraduate Courses in Diseases of the Chest

CHICAGO, ILLINOIS — OCTOBER 16-20, 1950

St. Clair Hotel — 5 days — Tuition $50.00

Sponsored by the Illinois Chapter,
American College of Chest Physicians
With the Cooperation of Members of the Staffs of the
Chicago Medical Schools and Hospitals

NEW YORK, N. Y. — NOVEMBER 13-17, 1950

Hotel New Yorker — 5 days — Tuition $50.00

Sponsored by the New York State Chapter,
American College of Chest Physicians
With the Cooperation of Members of the Staffs of the
New York City Medical Schools and Hospitals

NASHVILLE, TENNESSEE — JANUARY 22-26, 1951

Vanderbilt University — 5 days — Tuition $50.00

Sponsored by the Southern Chapter, American College of Chest Physicians
and Vanderbilt University School of Medicine

SAN FRANCISCO, CALIFORNIA — FEBRUARY 13-17, 1951

Postgraduate Extension Building, University of California

5 days — Tuition $50.00

Presented by the California Chapter, American College of Chest Physicians
in cooperation with the University of California Medical School and
Stanford University School of Medicine

For further information please write to the Executive Office
American College of Chest Physicians,
500 North Dearborn Street, Chicago 10, Illinois

Medical Service Bureau

POSITIONS AVAILABLE

Positions open for physicians in large tuberculosis hospital. Salaries from $4,800 to $7,320 annually. Must be eligible for license to practice in Georgia. Contact Personnel Office, Battey State Hospital, Rome, Georgia.

Junior Resident on thoracic service (approved by AMA 3 years for pulmonary disease). If objective is specialty in thoracic diseases, a recent graduate with rotating internship and residency in medicine is required. If objective is thoracic surgery, recent graduate with rotating internship and residency in surgery is required. Santa Clara County Hospital is a 500 bed institution with a tuberculosis service of 130 beds and a large out-patient chest department. Salary is $235 per month plus three meals and laundry. For further information apply to Dr. Charles L. Ianne, Chief of Thoracic Service, Santa Clara County Hospital, San Jose, Calif.

There will be several vacancies for resident physician on medicine at Seton Hospital effective January 1, 1951. Seton Hospital is a municipal tuberculosis institution with 450 beds for adults and children. The residency is approved by the Council on Medical Education of the American Medical Association. It is affiliated with the Morrisania City Hospital for training in non-tuberculous chest diseases where residents are on rotation service. The Hospital also has a teaching affiliation with the New York Medical College, Flower and Fifth Avenue Hospitals. The salary is $1,560 with single maintenance. Those interested please write or telephone the medical Superintendent, Seton Hospital, 3221 Henry Hudson Parkway, Bronx, N. Y.

Vacancy available for a full time physician in charge of tuberculosis at the Hospital de Medicina y Cirugia Toràcica, Hato Tejas, Puerto Rico. Training in tuberculosis desirable. Starting salary $6,000 annually, opportunity for advancement, unfurnished house available. Knowledge of Spanish not necessary. Married or single. For further information please address Dr. E. D. Maldonado Sierra, Calle Mejico No. 17, Hato Rey, Puerto Rico.

Residency in thoracic surgery in Oregon available beginning July 1. For further information please address Box 214A, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

Full time physician wanted with proper training to take charge of tuberculosis department of county hospital in California. Approximately 100 beds and out-patient clinic. Please write indicating salary required and when able to assume position. Address Box 215A, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

Chest physician for sanatorium in Alaska with training and experience in internal medicine and in the diagnosis and care of patients with chest diseases. Physician also to serve as medical officer in charge of the sanatorium; some experience or knowledge of hospital administration advantageous. Annual increases in salary, retirement and other benefits. Salary $8,400 to start plus furnished quarters. Please address Box 216A, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

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White Puerto Rico physician, graduated from the Medical College of Virginia, six years experience in general practice and ten years experience in internal medicine and diseases of the chest, desires position. Licensed to practice in New York and eligible to a license in Ohio either by reciprocity or by taking Board examinations. Please address Box 246B, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

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